The Electrical Industry's Weekly Magazine | June 26, 1961

Electrical World

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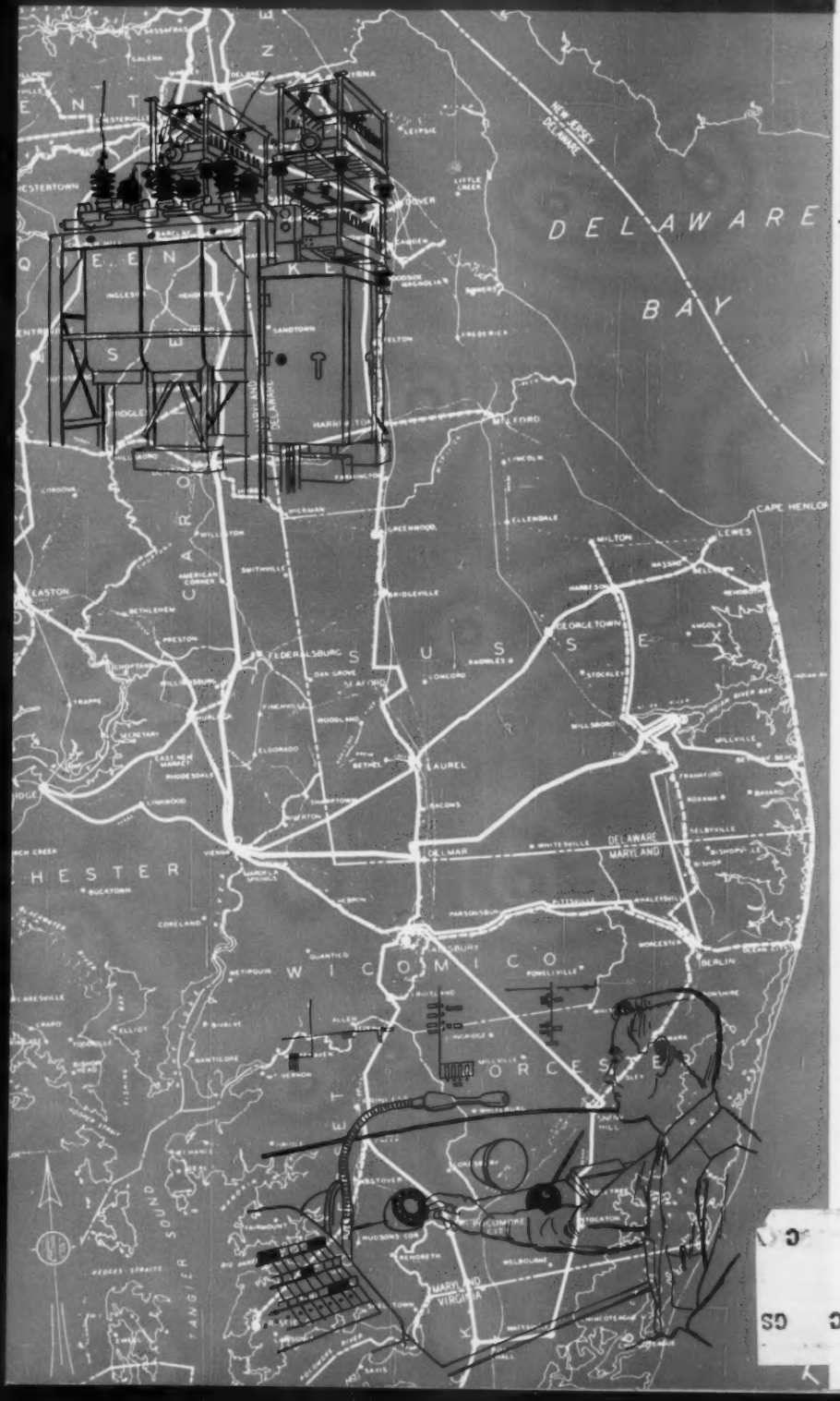

Third of Six Reports for 1961

Starts on p 69

Coded Radio Switches Capacitors to Control System Reactive

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General Electric's new 200-amp ringless design offers you today's best socket buy. Consider cost. New SI-60 is priced as much as 50% less than any other fully-rated 200-amp socket. Consider advanced design. Operation of G-E's new, exclusive screw-operated manual by-pass is fast, simple...requires no special tools, jumpers or clips, just a screwdriver . . . self-contained, positive action. Unique terminal block assembly—with one-piece combination jaw and connector strap—offers greater reliability through low heat rise. And consider versatility. To increase application, help cut stock costs, G-E's new SI-60 socket fully meets industry requirements for aluminum or copper wire. For complete information contact your G-E Sales Office or Authorized Distributor. Or, write General Electric Company, Somersworth, New Hampshire.

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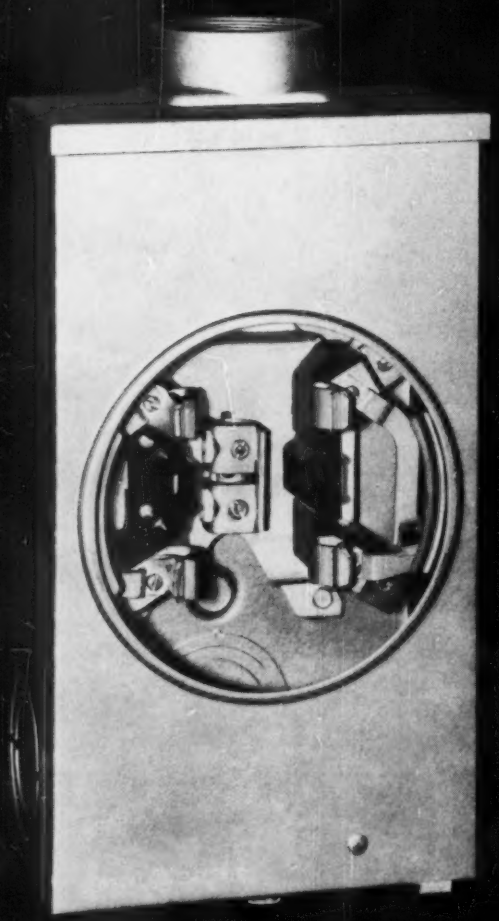

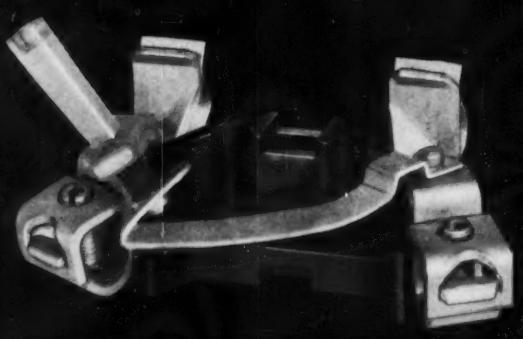

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GENERAL ELECTRIC

Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

June 26, 1961
Vol. 155, No. 26

Dateline...

Is Ottawa Changing Views on Power Export?

Ottawa, Canada—There is persistent talk here that the curiously strong position of the British Columbia provincial government regarding development of the Upper Columbia River is causing the federal government to soften its long-standing position against power exports.

There are no official statements on the subject, but the capital scuttlebutt is that the federal government is embarrassed by the delay in ratification of the treaty, and may have to make a concession on power exports in order to get British Columbia to call off its tigers.

In fact, there is a rumor that B.C. has actually proposed a deal whereby it will drop opposition if it is allowed to re-sell power to the Pacific Northwest.

Other factors that might influence a possible change in attitude toward exports are **(1)** increased experience with time clauses in export contracts that allow the government to cancel the export at a predetermined date, and **(2)** the possibility that thermal power may be as cheap as hydro power, and thus making the hydro power less precious than it once was.

If the rumors prove true, then it is possible that ratification of the Columbia Treaty will come sooner than the two years that have been predicted by some Pacific Northwest (US) utility people. Their predictions are based on the theory that British Columbia does not need the power for itself, and therefore can afford to be a holdout on ratification.

With permission to re-sell and export, however, British Columbia believes it would be in a position to handle power from the Upper Columbia development, plus power from Peace River, which is a project favored by the B.C. government.

US influences are inadvertently strengthening British Columbia's bargaining position with the Canadian government. One of these is the proposed intertie between California and the Bonneville Power Administration.

Negotiations between British Columbia and the federal government are bogged down at the moment while the B.C. Energy Board completes the study ordered several months ago by B.C. Premier W.A.C. Bennett. Caseco Consultants Ltd is conducting

(*Continued on page 5*)

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G&W makes no network cables or transformers. But it does make network switches; we think the best in the business. Here are some of the reasons why.

G&W Standardized Type N Network Switches meet and exceed all EEI NEMA Standards:

1. Rated 15 kv, 95-kv Basic Impulse Level, 200-ampere continuous current carrying capacity, 5-second short-circuit rating of 15,000 amps in the grounded position.
2. Rated no voltage break or transformer exciting-current break, including appropriate electrical interlocking arrangement.

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1. Patented rocker-arm switch construction, which includes Permali® stringer for holding the three-phase contacts (a specially designed laminate known for its excellent mechanical and electrical characteristics.)
2. "Z"-slot operating handle, which prevents overriding of the electrical interlocks by mechanically blocking direct operation from "off" to ground.
3. Encapsulated interlock coils, for use with either oil or askarel.
4. Magnetic oil-level indicator with retained gasket reduces the possibility of liquid leakage.

These are some of the significant reasons why any network-switch application is more reliable when G&W Type N Network Switches are specified as part of their construction. A complimentary copy of G&W Engineering data sheet No. 614.101 available upon request.

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Electrical World

Dateline . . .

Ottawa, Canada (*Continued from page* 3)

studies for both the Energy Board and the B.C. Power Commission, comparing Peace River and Columbia River development, and is expected to have them ready in mid-August.

One of the reasons rumors about exports are flying around is attributed to statements made by Dr Gordon Shrum, chairman of the B.C. Energy Board. He told the British Columbia Chamber of Commerce that exporting power is the only way B.C. can secure low cost power for itself out of Columbia development.

Some of the statements he made were:

- The costs of hydro, atomic and thermal energy now average out to roughly the same.
- B.C. has already lost a market in the Pacific Northwest for export power until 1970 at least, so the remaining market is California.
- The downstream benefits provided for in the Columbia Treaty have "befuddled" some Canadians into thinking that they are getting something for nothing.
- Figures on Columbia power provided by the federal government indicate that Columbia power may not be cheap, but would compare with the cost of power from B.C. Electric's Burrard thermal plant.

He said he could not see why recapturing exportable power was any problem.

"People have brought in every argument against the export of power including ancestor worship," he said.

His point about the Pacific Northwest market for Canadian power being dead until 1970 is tied to his assumption that generation facilities will be added to the Hanford reactor.

Ratification is definitely not expected in the regular session of parliament, which is coming to a close, but it could come in a special session this fall.

Letters

Another Viewpoint on Area Development

To the Editor:

Without a doubt you will be deluged with letters relative to "Dateline" May 22nd, wherein you show undisguised greediness in begrudging the nation's rural electric cooperatives a share in the Area Development Program. Not only that but you infer criticism toward the National Rural Electric Cooperative Association's attempt to bring industrial development to the rural areas. Shame on you! The farmers, as a whole, have been fighting a losing battle for the better part of 30 years. This, in spite of greater unit productivity, better farming methods, and fewer farms. There are many who still love the "country" but must move to "town" to earn a livelihood. Rural industry would be a Godsend to these people as well as helping to supplement the income of those already "down on the farm". You "City Slickers" are forever crying about so-called subsidies to the farmers but then let an opportunity come along to improve his lot and you turn "crybaby" about that just because you are not going to get fat off of the undertaking . . .

There are flashes of brilliance among the minds of the electrical utility people on occasions. Witness the strides made in the entire industry in the LBE program. How much more could this be multiplied if all segments were to join hands in a common effort by adopting a policy of not just "Live and let live" but of "Let's all live and help live—electrically".

The areas of service are reasonably well established today. If the commercial company could only overcome its greediness in wanting the "whole hog" and accept its role as power distributor in these areas and wholesaler to the areas outside, such a unity could exist and the entire industry and country would benefit.

J. L. Griswold
Tallapoosa River Electric Cooperative
LaFayette, Ala.

▶ We believe that a re-reading of our May 22 "Dateline" column will indicate that Reader Griswold "doth protest too loudly." There was no attempt to cast aspersion at either the co-ops or NRECA, but merely an attempt to analyze the possible results of the redevelopment program.

ELECTRICAL WORLD
Vol. 155, No. 26 June 26, 1961

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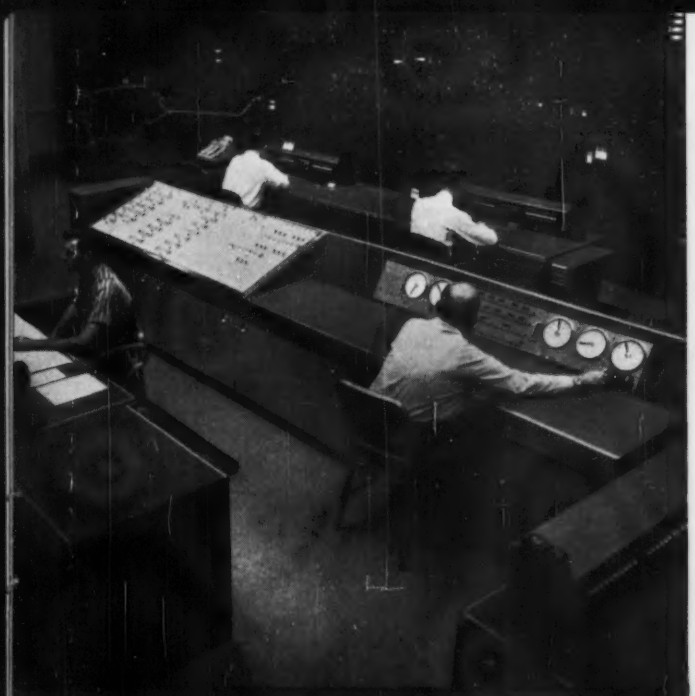
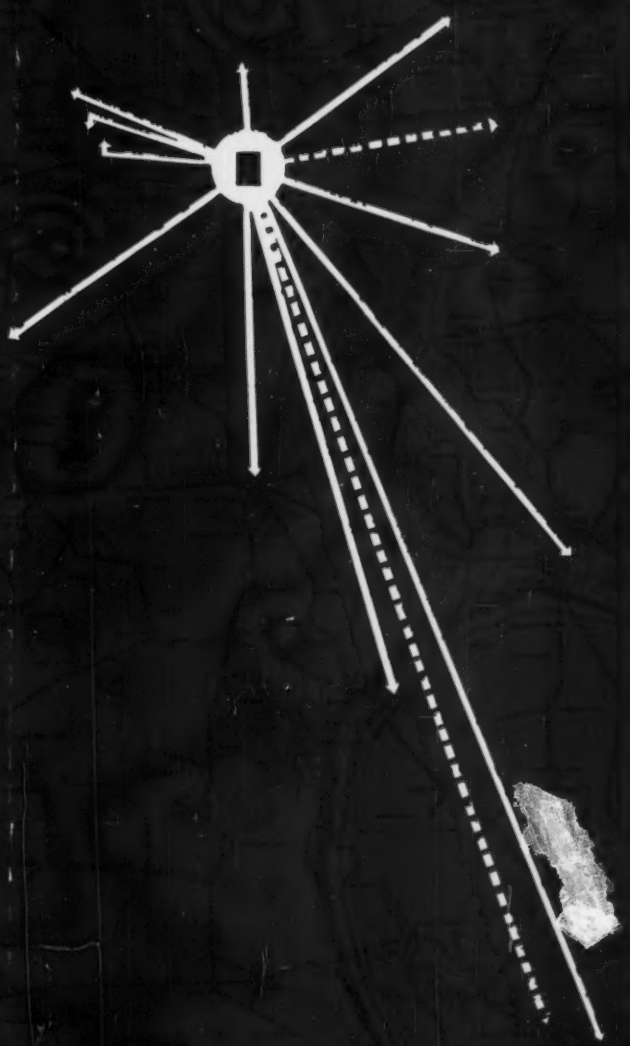




When so much depends on so little... it pays to rely on the best

The layman might be surprised to learn that power for a three-state area is controlled by a machine that draws less current than a single hot plate.

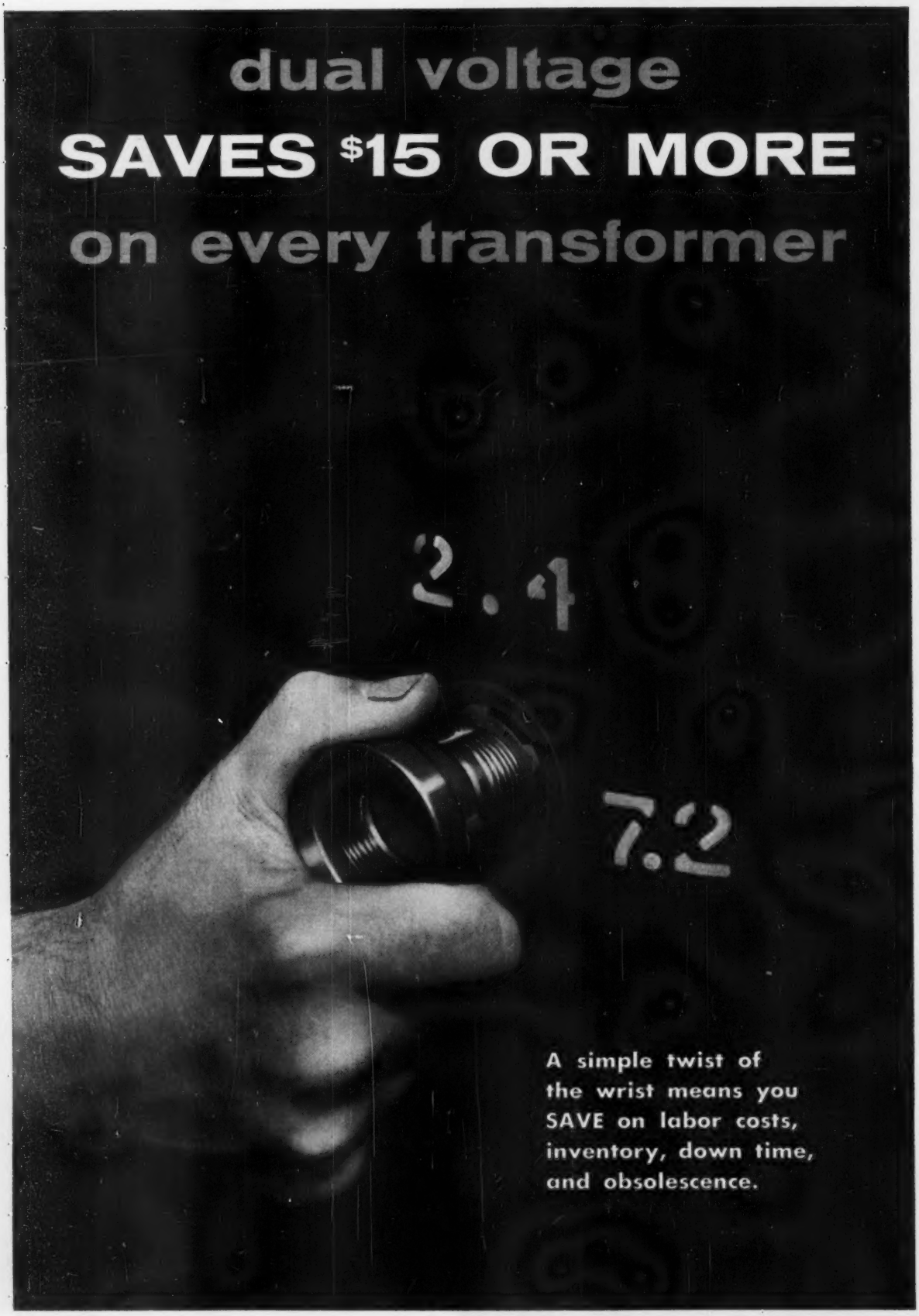
It's true! This Desired Generation Computer, built by Leeds & Northrup Co., controls the two-million Kw Middle South System on a 1.5 Kw power supply.

But of much greater importance to the System Operator is the fact that computer-control can have a profound effect on operating costs.

Verify this fact to *your* satisfaction. Talk with the men who today operate L&N computer-controls (there are ten in operation, with six more being built). We're confident you'll find that their experience confirms what you may have heard:

The Desired Generation Computer-Control is the finest automatic economic dispatch system ever built by Leeds & Northrup. Contact your nearby Leeds & Northrup Co. Field Engineer, or 4938 Stenton Avenue, Philadelphia 44, Pa. for additional information.

LEEDS & NORTHRUP *Pioneers in Precision*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A simple twist of
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inventory, down time,
and obsolescence.

SAVE ON LABOR COSTS

Change voltage with a twist of the externally mounted switch . . . no connection changes *inside* the transformer tank are necessary. Keyed handle assures correct switch positioning, everytime. This simple operation means only one transformer needed on the pole before and after cutover . . . a big savings in labor costs!

SAVE ON INVENTORY

Increasing system voltages the RT&E dual-voltage way, means you buy and store fewer new units . . . less capital is tied up in new transformers. Dual-voltage transformers are versatile . . . can be used on both old and new voltages. Less inventory means more storage space for other equipment, more efficient use of warehouse space.

SAVE ON DOWN TIME

With dual-voltage transformers in operation, large areas can be cutover to higher voltage in far less time. Interruption of customer service is very short making for good customer relations. Less down time means cutover crews are released faster.

SAVE ON OBSOLESCENCE

Installing dual units in future cutover areas reduces the number of lower voltage transformers purchased. Units that are taken down can be used for parts of the system that will not be uprated. This saves money in obsolescence of the lower voltage transformers.

plan to save . . . plan for the future . . .

use RT&E *Dual-Voltage Transformers!*

Since R T & E introduced the industry's first externally operable dual-voltage transformers in 1955, a constantly increasing number of leading utilities have planned for the future by using the R T & E dual-voltage system. Case histories show economies realized in labor, inventory, down time, and obsolescence well in excess of $15 for each transformer installed.

To see how these savings can be computed, ask your R T & E representative, or write, for the R T & E bulletin entitled, **"Distribution System Conversion to Higher Voltage Using Dual-Voltage Transformers."**

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Dual Voltage Transformers are a result of Engineering Talent Concentration on One Idea — A Better Transformer.

TURBINES:

Shell reveals three ways that Turbo Oils help prevent oil breakdown, rust, sludge and foaming

Small quantities of air and water can work their way into any turbine lubrication system. These contaminants can accelerate oxidation of the oil.

Read how Shell scientists developed a specific formulation that counters this oxidation and brings you turbine lubricating oils with top performance records.

WHEN oxygen attacks turbine oil, it can form peroxides and organic acids. A chain of oxidation reactions begins. If the oil stability is inadequate, sludge can form.

Air entrained in the oil can aggravate oxidation. And it may cause foaming.

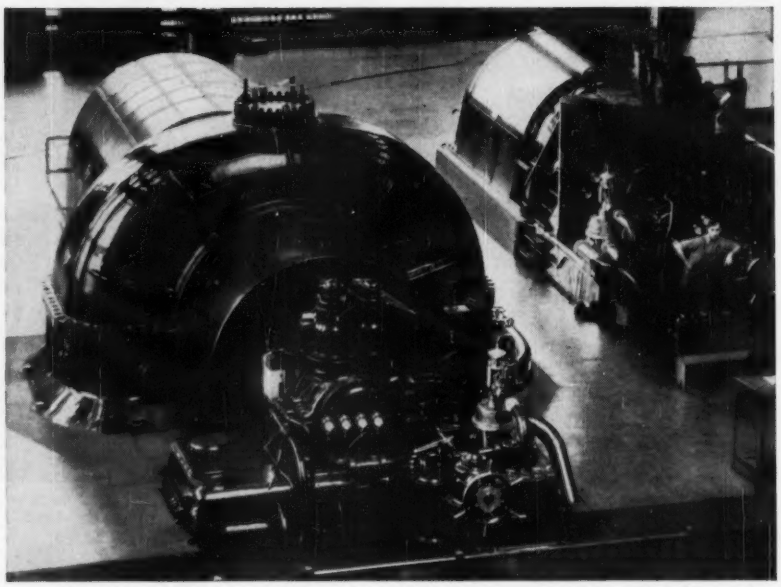
The oil may also be affected by water in the system. Laboratory tests have shown that water can greatly accelerate an oxidation process.

With Shell Turbo® Oil, Shell tackles these problems in three key ways:

1. *Shell carefully selects base oils for use as turbine lubricants,* then refines them to get the most effective response to Shell's special additives.

2. *Shell adds a powerful oxidation inhibitor to its precisely refined base oils.* This inhibitor helps prevent the chain of oxidation reactions caused by oxygen exposure at operating temperatures. It helps keep the oil in good condition, and lengthens its service life.

The result is that Shell Turbo Oils have proved themselves unusually stable over long service periods.



Shell Turbo Oils lubricate turbines with total rating of more than 17 million kw in the U. S. and Canada.

3. *Shell uses an outstanding rust inhibitor.* As a protective measure, Shell uses special additives that cover metallic surfaces with strongly adherent polar-type films.

These films are specially designed to help keep water from the metal surface.

In drastically accelerated laboratory tests, metals immersed in Shell Turbo Oils show outstanding anti-rust performance—even in the presence of sea water.

Ask your Shell Industrial Products Representative for facts on Shell Turbo Oils. Or write: Shell Oil Company, 50 West 50th Street, New York 20, New York.

Memo to utilities

Ten turbines in the U.S. have been running on Shell Turbo Oil 27 *since 1938.*

In Canada, Shell Turbo Oils lubricate turbines generating more than half of all steam power produced.

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are working to provide better products for industry

What year were these POLE STAR® TRANSFORMERS manufactured?

1957
1958
1959
1960
1961

Without checking serial numbers of the transformers, the answer to that question would not be easy, even for Pennsylvania Transformer personnel. The reason: a long-standing policy of CONSTANT PRODUCT IMPROVEMENT for Pole Star Distribution Transformers.

CONSTANT PRODUCT IMPROVEMENT means that refinements and innovations are introduced as soon as practicable after they have been thoroughly tested and approved. Pole Star users do not have to await periodic new models before benefiting from Pennsylvania's year-around research and development program, and from the constant search for new and better production methods.

Thus, although the appearance of Pole Star Transformers has not been drastically altered the past few years, dozens of changes were introduced during that period— including such things as:

- V.I.P. Finish, which doubled tank protection
- "Echelon" lap-on-top core, which provided lower-than-ever exciting current and other electrical improvements
- Refinements in an insulation system that is one of the most effective in use today
- Sky-blue Covers to protect against animal-caused outages
- Series-multiple switch, an optional feature
- Elimination of external bushing clamps

CONSTANT PRODUCT IMPROVEMENT is a major reason why purchasers of Pole Star Transformers are assured of the highest available quality—and outstanding operating efficiency—year after year. What this policy means *today* is shown on the reverse side.

The transformers pictured were made in 1959.

PENNSYLVANIA TRANSFORMER DIVISION McGRAW-EDISON COMPANY
CANONSBURG, PENNSYLVANIA

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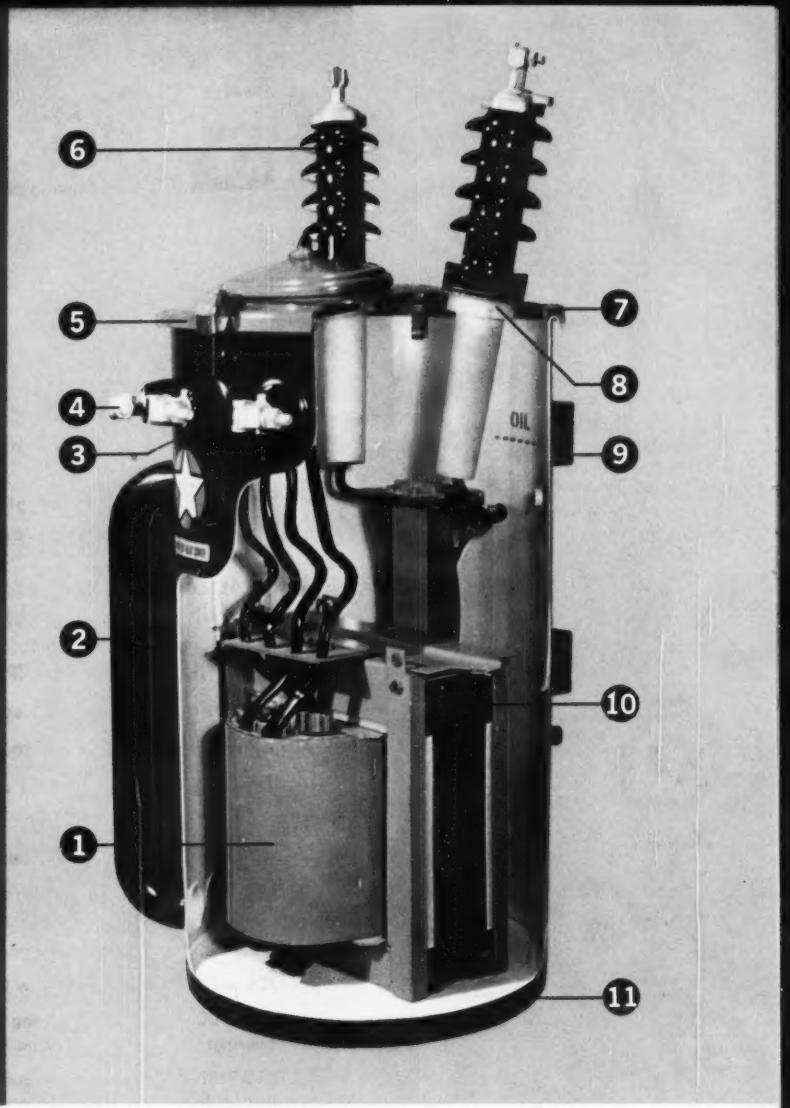
Turn page for facts about features

POLE STAR

POLE STAR® DISTRIBUTION TRANSFORMERS

known for reliability and getting better all the time... as a result of Pennsylvania's policy of CONSTANT PRODUCT IMPROVEMENT



1. High-strength insulation system
Since its introduction several years ago, the highly effective Pole Star insulation system has been periodically upgraded as suppliers were able to meet higher specifications. As a result, Pole Star Transformers provide overload guarantees equal to or better than any being offered today—permitting continuous operation at 65°C rise.

2. Double-sealed cooling tubes
Cooling tubes—made in Pennsylvania's own plant—are expanded tightly against the tank wall, then are welded inside the tank, where there is ample room for a thorough job. Thus, tubes are given a double seal to protect against leakage and keep the transformer on the job.

3. V.I.P. finish
Five-step V.I.P. paint process *doubles* tank protection. It sets up extra-high primary resistance to moisture, alkali and acids . . . and also provides a secondary or insurance barrier that prevents the spread of corrosion if any bare metal becomes exposed, as in the case of accidental scratching.

4. Double-keyed sidewall bushings
Low-voltage sidewall bushings feature a double-keyed construction that prevents bushings from rotating in whole or in part when line connections are made.

5. 'Sky-blue' cover
To prevent animal-caused outages and protect wildlife, insulated cover is standard on all units with cover bushings. Sky-blue color facilitates identification in storage, on poles.

6. Pressure-tested bushings
All bushings are pressure-tested after being assembled, to check both porcelain and connector seal.

7. Nitrile rubber gaskets
All gasket seals—at bushings, cover, handhole—are made with nitrile rubber properly compressed for maximum gasketing efficiency. Nitrile rubber is highly resistant to oil, heat, cold, moisture, dust, and other atmospheric conditions.

8. Internal bushing clamps
Absence of external clamps eliminates potential dirt catchers and sources of corrosion. Internal clamps are ring-type to assure uniform pressure.

9. Hand-welded hanger brackets
Hanger brackets are hand-welded completely around the bracket flange. No crevices are left that might remain unpainted and where rust-producing moisture can collect. Result: the transformer is on the pole to *stay*.

10. Echelon lap-on-top core
Noted for outstanding electrical characteristics since 1947, the patented lap-on-top core provides new highs in efficiency as a result of its new "echelon" look. One of but four basic oriented-steel distribution transformer cores being used today, the lap-on-top core is available *only* in Pole Star Transformers.

11. Triple-layer base
The tank side is rolled up over the tank-bottom flange, forming an extra-strong, triple-layer base. The joint is submerged arc welded completely around the tank to prevent any collection of moisture.

Production-line impulse testing
Among the first distribution transformers to be impulse tested on a production-line basis, Pole Star Transformers are tested *without arresters*. The apparatus used is so sensitive it will detect even single-turn faults.

PENNSYLVANIA TRANSFORMER DIVISION
McGraw-Edison Company • Canonsburg, Pennsylvania • Greater Pittsburgh District

See other side for more about CONSTANT PRODUCT IMPROVEMENT

Electrical World

JUNE 26, 1961
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TRANSMISSION GRID ties New York State generation and loads.

The Electrical Week

LATE NEWS ▶ **National Electrical Mfrs Assn issues "Statement of Principles"** to guide its members in compliance with antitrust laws. Statement calls antitrust laws "charter of free enterprise" and urges adherence. Eight principles are given as obligations of each firm in the industry.

Sen Estes Kefauver (D-Tenn.) proposes immunity from prosecution for subordinates in antitrust cases to compel them to testify against those involved. Kefauver advanced the proposal at a Senate Judiciary Committee hearing on seven anti-racketeering bills introduced by Attorney General Robert Kennedy.

AIEE Summer General Meeting at Ithaca, N. Y., hears television pioneer Dr Allen B. Du Mont propose a government-sponsored TV network to combat the lack of noncommercial, intellectual, and informative programming. FCC Chairman Minow does not support the idea. **Dr John G. Trump receives AIEE Lamme Medal** for achievement in design of particle acceleration and X-ray generators and for exceptional contributions which led to applications in the treatment of malignant diseases. **Warren H. Chase,** vp of Ohio Telephone is named AIEE's 1961-62 president, replacing C. H. Linder of General Electric.

Germany's first power reactor at Kahl starts power production. Production levels of up to 75% of full rating of 15 Mw are reached, the highest allowed by government permit. After tests it will go to full 15-Mw power levels.

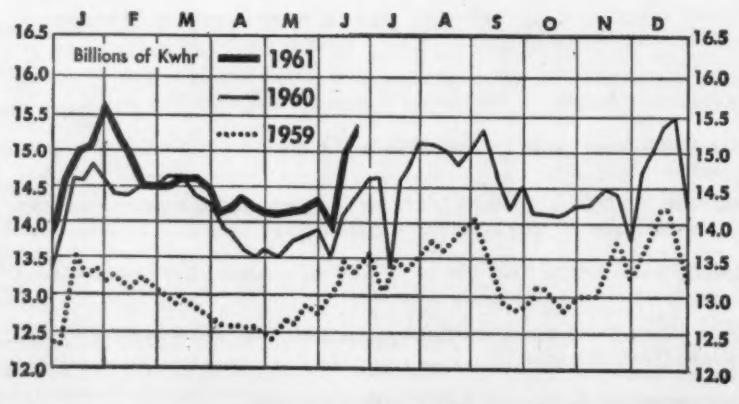
Merger of Pacific Power & Light and California Oregon Power Co is approved by the FPC. Also approved was transfer of 26 Copco hydroelectric licenses to the surviving corporation, PP&L. FPC also approved Arkansas Power & Light's purchase of Arkansas Utilities facilities for $3 million.

Fryingpan-Arkansas reclamation project is approved by the House Interior Committee with a 19-4 vote. A favorable report to the House Rules Committee is expected by the end of this month. The project would cost $170 million, have a capacity of 123,900 kw in several Upper Arkansas River basin plants.

In rebuttal arguments before the FPC, Pacific Northwest Power testimony states: "WPPSS has demonstrated no need whatsoever for additional power supply until 1970-71, with the reasonable expectation that they will have no need whatsoever for a power supply until 1974-75."

Management changes: Edward R. Felber is elected president and general manager of Madison (Wis.) Gas & Electric, succeeding Theron A. Brown who becomes chairman of the board.

WEEKLY POWER OUTPUT—Up 6.3 % (Week ending June 17), Kwhr 15,345,000,000



Percent Change From Previous Year

	June 3	June 10	June 17
Total U. S.....	+ 2.8	+ 6.1	+ 6.3
New Eng.	+ 4.8	+ 9.2	+ 6.8
Mid. Atlan....	+ 2.9	+ 7.7	+ 8.0
Cent. Indust...	+ 1.0	+ 4.0	+ 5.9
West Cent.....	+ 3.9	+ 7.9	+10.4
Southeast	+ 4.2	+ 8.9	+ 6.2
South Cent.....	— 0.4	+ 2.1	+ 2.4
Rocky Mount...	+ 7.5	+ 3.1	+ 7.6
Pacific			
NW	+ 4.9	+ 6.7	+ 2.1
SW	+ 2.9	+ 4.6	+ 7.8

Seasonally Adjusted Index 293

Week Ago 293 Year Ago 276

Source: Edison Electric Institute

Supply Lines

GENERAL ELECTRIC HOLDS OUT ON CONSENT DECREE

Justice Department spokesmen have indicated that the four electrical equipment manufacturers who have agreed to sign consent decrees in settlement of civil price-fixing charges will be protected if General Electric Co goes to court instead of signing a decree.

GE has said it ". . . has been unable to reach agreement with the Department of Justice on certain provisions of a consent decree. The company is prepared to consent to a decree which has as its purpose the preservation of vigorous competition. The provisions proposed by the government will not serve this purpose, but in fact will limit competition and are not, in our opinion, in the best interests of the company, the industry or its customers.

"The company's major objection is to a provision of the decree which would in effect create a government sponsored price support program in the electrical industry."

One problem faced by the four companies who have agreed to sign (Westinghouse, Allis-Chalmers, I-T-E Circuit Breaker, and Federal Pacific) is their competitive position if GE is not bound by the same restrictions they would be if they sign the consent decrees, which makes them agree not to charge "unreasonably low" prices.

Justice Department spokesmen say there are at least four possible ways to protect the signers. First, the decrees could contain a clause providing that any specific provisions which GE manages to eliminate could be eliminated from their decrees. Or they could have a provision that they will not become effective until the GE decree becomes effective with an opening for revisions to conform with the GE decree. Third, they could simply have open paragraphs which would be filled in after the final GE settlement. Fourth, the companies can go to the court and have their decrees modified to conform with GE's.

One precedent for arrangements of this kind are found in an auto financing subsidiary case in the late 1940's. Ford and Chrysler agreed to give up their financing subsidiaries, but General Motors did not want to and went to trial. The Ford and Chrysler decrees contained clauses that said that after a certain period of time, if GM was not forced to close down GMAC, the other two manufacturers would not have to get out of the auto financing business. Ford, as a result, recently re-entered the financing end of the business.

GE's primary objection to the consent decree is directed at the "unreasonably low" prices clause, which in effect places the burden of proof on the company in a contempt of court action if a competitor complains about GE prices. GE officials contend that this would force the company to keep prices so high that even inefficient competitors would not be injured.

L-M REALIGNS PRICES OF CONSTRUCTION ITEMS

Net price based on realistic cost pays a reasonable return is the new pricing concept being applied to all items in the construction materials line of Line Material Industries, McGraw-Edison Co. This new pricing concept, effective July 1, is being explained in a letter to L-M's customers from Clifford W. Petersen, Prod-

uct manager, construction materials department, and revealed to *Electrical World*.

Application of the cost-plus-return-equals-net-price formula to every item in the construction materials line will reduce the prices of about half the items. Price increases will be made for other items on which L-M has "been taking a loss in order to stay competitive." L-M gave *Electrical World* these examples of the new Zone 1 price changes: Average for entire line of anchors, down 4.2%; crossarm braces, down 0.5%; and clevises, up 0.5%. All construction materials, including porcelain, will be priced to include the lowest freight cost allowed, taken as an average for the entire zone, into four zones rather than the present five (Zone 5 is being absorbed into Zone 4). L-M feels that uniform zone pricing is fairest to all concerned.

The new pricing concept is a result of a two-year item-by-item re-appraisal of the cost of producing and marketing every item in the line, L-M says. Evaluation was made of all costs of labor, freight, materials, complexity of fabrication, tooling, plant investment and engineering and research. "We have become convinced that the only fair way to price construction materials is to consider each item individually," L-M points out. "Apply the formula and offer (the item) in the market place at the resultant price . . . we sincerely feel this is the only equitable way in which we can pay for the research necessary to provide tomorrow's construction materials and continue to offer well-engineered, high-quality products at reasonable prices," the letter states.

ELECTRIC MOTORS TO GET ATTENTION OF KEFAUVER GROUP

The Senate Antitrust & Monopoly Subcommittee was scheduled to start hearings late last week (June 22-23) to inquire into possible antitrust violations in the electric motors industry.

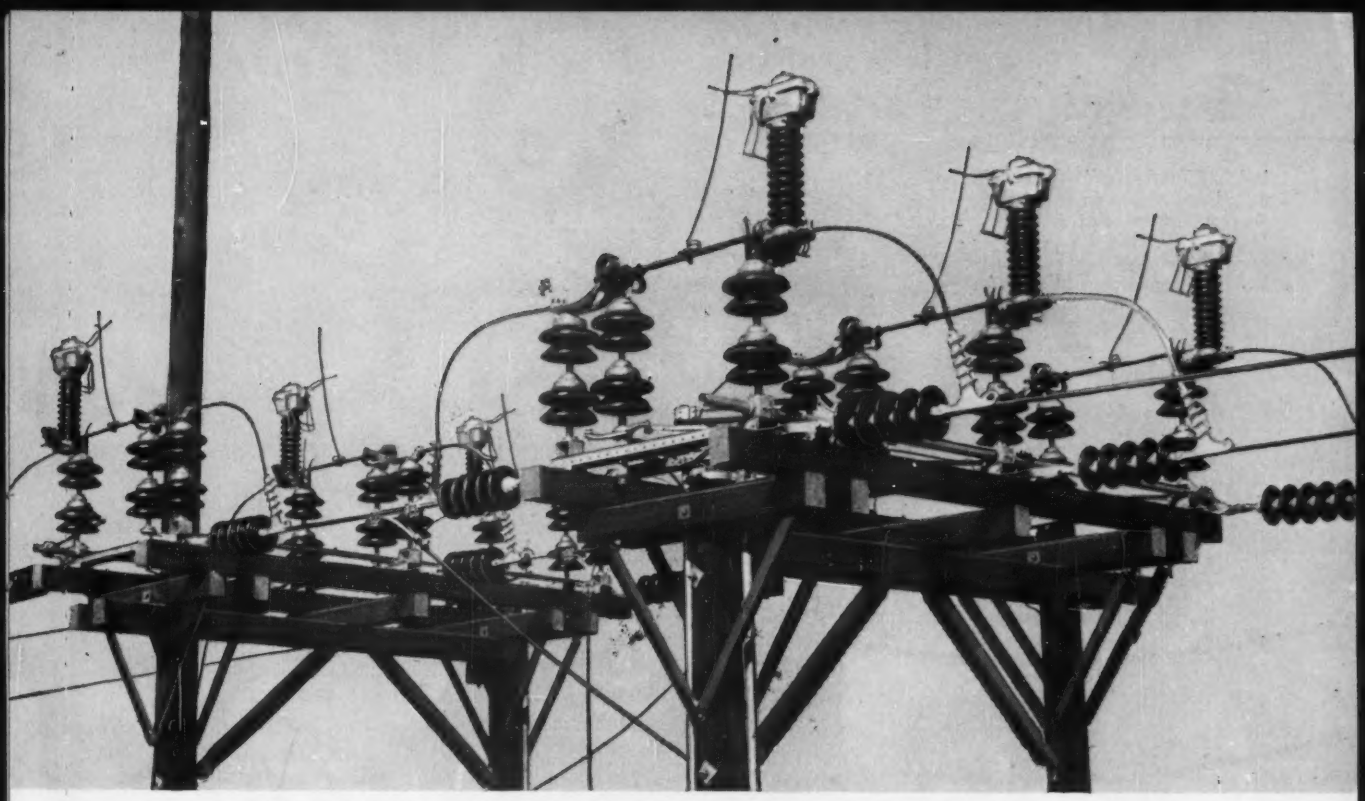
Motors were not included in antitrust charges handed down against various electrical manufacturers, but Sen Estes Kefauver (D-Tenn.) and the staff of his subcommittee believe they have evidence of price fixing meetings related to electric motors.

'BUY AT HOME' WRITTEN IN NORTHWEST PURCHASE ORDER

Specifications in a recent purchase order by Washington Water Power Co require that locally produced aluminum be used in the 760,000 lb of aluminum conductor it is buying to build its portion of a transmission line. The purchase order requires that aluminum from Kaiser Aluminum's Mead reduction works at Spokane be used in the conductor, which is to be manufactured in Newark, Ohio.

NEW TRANSFORMER PLANT SCHEDULED FOR TAMPA

Pennsylvania Transformer Division of McGraw-Edison Co is planning to build a $2-million transformer manufacturing plant in the Tampa Industrial Park. Florida, New Orleans and Houston will be supplied from the plant. Pole-type transformers will be produced initially, but long-range plans call for doubling the size of the plant and extending into heavy transformer product lines.



THESE L-M 69 kv OIL INTERRUPTERS, mounted on L-M PV switches, provide low-cost interruption for the Grand Valley Rural Power Line substation tap of Public Service Company of Colorado.

L-M Oil Interrupters Provide Low-Cost Load Interruption for Public Service of Colorado

L-M Type PV air-break switches and high-voltage oil interrupters were installed for Grand Valley tap of Public Service Company of Colorado at transmission line tie

The Grand Junction and the Cameo steam generating plants of Public Service Company of Colorado are tied together by a 69 kv transmission loop 45 miles long. At the Grand Valley Rural Power Lines substation tap, 15 miles from the Cameo plant, the two lines are tied together by means of two gang-operated L-M Type PV air-break switches equipped with oil interrupters on both sides of the substation tap. With L-M oil interrupters, the switches sectionalize the line on either side without disturbing power flow to this substation.

Increased Flexibility at Minimum Cost

L-M OIL INTERRUPTERS provide a load-interrupting means at the lowest possible cost. By installing L-M Type PV air-break switches and oil interrupters, Public Service Company of Colorado typfies utilities who are cutting costs without sacrificing quality and dependability on switching problems.

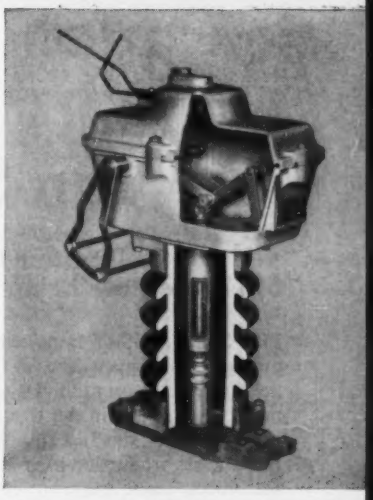
L-M's oil interrupters have been specifically designed to provide a low-cost means of picking up or interrupting load currents, line charging currents and magnetizing currents. They can be mounted on new or existing Type PV vertical air-break switches, with no change in the electrical clearances or phase spacing.

Complete Range of Ratings

L-M oil interrupters are available in voltage ratings of 23, 34.5, 46 and 69 kv. All have continuous current ratings of 600 amperes at power factors as low as 70%, with momentary rating of 40,000 amps for 10 cycles and 25,000 amps for 4 seconds.

Get Complete Information

Ask your L-M Field Engineer for complete information on L-M oil interrupters. He has a cutaway sample to show you. Or write direct to Line Material Industries, Milwaukee 1, Wis.



Be sure you see this cutaway sample! With it, your L-M Field Engineer can demonstrate the construction and operation of this excellent, economical Line Material load break device.

LINE MATERIAL® Industries *Power Switching Equipment*

McGRAW-EDISON COMPANY

435R

DISTRIBUTION TRANSFORMERS • RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON

L-M SRT TRANSFORMERS are self-contained and require no more pole space than conventional pole type transformers. The electronic control is completely external, permitting field adjustment of band midpoint from 120 to 126 volts.
SRT
25·30

L-M SRT® Transformers Now Cost Less: You Can Save Up To $55 Per Transformer

Test period now completed proves SRT transformers reliable. Electronic SRT's are now being mass produced for stock shipment at lower price.

Line Material's SRT transformer has entered the final phase of product development. The SRT transformer has been successfully field-tested by most utilities throughout the nation. It has proved more than reliable in every respect.

L-M has had the SRT transformer in full production for some time. Mass production has resulted in short delivery time for our customers, stock shipment in most popular sizes, and lower overall cost for L-M. Line Material now passes along these benefits of mass production through lower costs to you. SRT transformers are priced as a standard tapped transformer with an adder for the SRT components.

Now you can have the benefits of SRT transformers at additional savings up to $55. Ask your L-M Field Engineer how the use of SRT transformers can reduce your distribution costs.

THE SRT TEST PLUG, right, can be used to determine if all components are functioning properly. It also permits operator to place transformer on any tap position desired should there be a reason to remove the automatic control. When the electronic control is removed, the SRT operates as a fixed-ratio transformer.

OUR 50TH YEAR LM 1911 — 1961

LINE MATERIAL® Industries

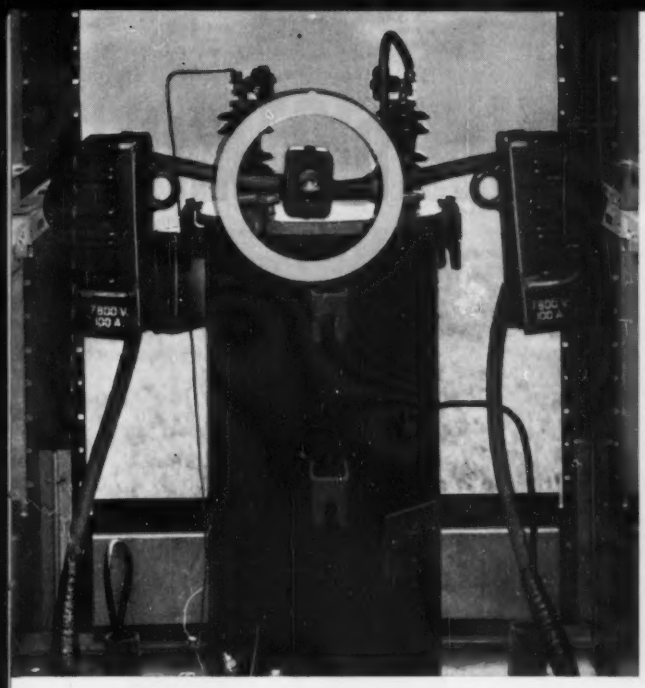
McGRAW-EDISON COMPANY

507

Transformers

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT



New L-M Fault Indicator mounted on the primary feeder in a transformer installation in an L-M Transclosure.

L-M Fault Indicator mounted on a primary feeder in an L-M Pad-Mount transformer. Indicator may be mounted either vertically or horizontally. To reset, just turn the handle. (Inset): Fault Indicator has tripped, exposing yellow section, showing that a fault exists beyond this point.

L-M's Economical Fault Indicator Quickly Locates Underground Faults

L-M's exclusive new Fault Indicator is a simple, inexpensive device primarily for installation on underground feeders in Pad-Mount® transformers or Transclosure™ housings. Should a fault occur, the Fault Indicator shows the general location, between adjacent transformers or sectionalizing points. One fault-hunting job could well pay for the installation of these L-M Fault Indicators.

The indicator can be applied to all underground circuits regardless of voltage. Over-current through the cable trips the indicator, which flips a yellow segment into view. Rating is 350 amperes nominal trip current. The indicator is mounted simply by threading the cable through the indicator yoke, and tightening the clamp.

The Fault Indicator also facilitates location of a faulted phase of a three-phase system. Fast half-cycle operation permits coordination of the indicator with protective devices over a wide fault-current range. And it costs less than $10!

Get Details On This Money and Time-Saver

Ask the L-M Field Engineer for details, and time current curves on this valuable, economical device. Or write Line Material Industries, Milwaukee 1, Wisconsin.

501-R

LINE MATERIAL®
Industries
McGRAW-EDISON COMPANY
Protective Equipment

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

Line Material Industries,
Milwaukee 1, Wisconsin EW-61

Please have L-M Field Engineer tell me how I can save time and money with the L-M Fault Indicator.

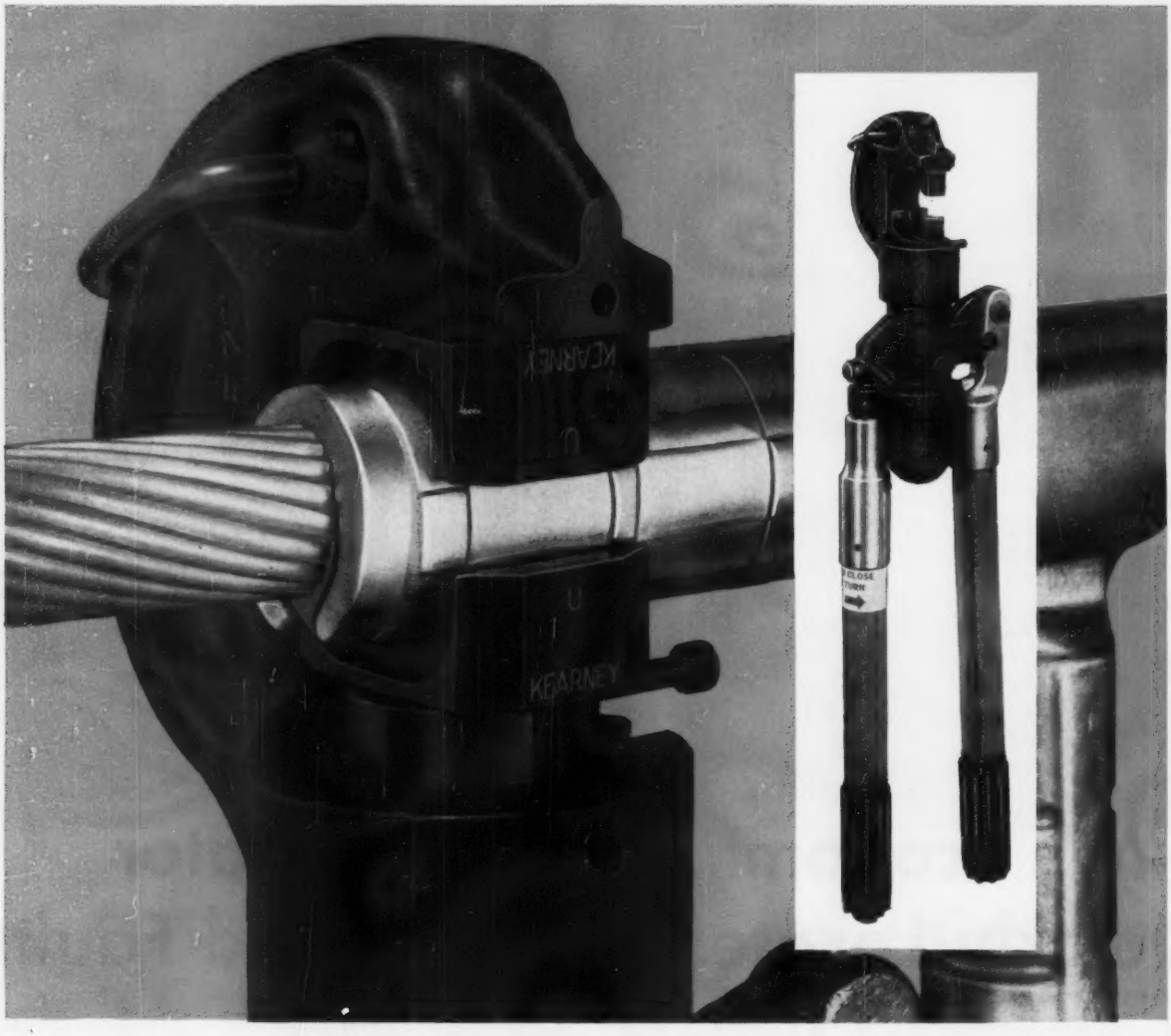
Name_____

Company_____

Address_____

City_____ State_____

KEARNEY WH-2 HYDRAULIC TOOL AND



This is the tool... Kearney does it again! The Kearney WH-2 Hydraulic Tool—big brother to the WH-1 Tool—is the FIRST and ONLY portable, hand-operated, hot-line compression tool to accommodate such a wide range of fitting and conductor sizes. Equipped with only this ONE tool linemen can now install tap compression connectors on all sizes of energized and non-energized conductors from #6 Solid through 636 MCM ACSR! Die sizes are the same as those for the Kearney WH-1 Tool, plus the additional sizes required to install the larger fittings shown on the opposite page. Dies snap in or out easily . . . can be secured with a set-screw. A two-step, high speed pump generates full 21,000 pounds of thrust. An automatic overload valve prevents over-compression. Large C-frame head allows clear view of work area while making indents. A partial rotation of one handle sets tool to compress or retract dies—no need to remove either hand from handles. Interchangeable insulated handles are available in various lengths to adapt tool to individual voltage requirements.

For further information, contact your Kearney

509

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH, IOWA

City_____State_____

2-PIECE COMPRESSION CONNECTORS

. . . extend the connection range to include installations on all "Hot" or "Cold" lines from #6 Solid to 636 MCM ACSR

Two-piece L-Squeezon Tap Connector
Two-piece T-Squeezon Bolted Tap Connector (4-hole terminal pad)
Two-piece T-Squeezon Bolted Tap Connector (2-hole terminal pad)
Two-piece L-Squeezon Hot Line Stirrup
Aluminum Squeezons
Two-piece T-Squeezon Compression Tap Connector
Cast Aluminum Terminals (2 and 4-hole pad)
Two-piece Cross-Tap Connector
Two-piece Repair Sleeve

These are the fittings . . . New, larger Kearney tap connectors and the Kearney WH-2 Hydraulic Tool now extend the tap compression connection range to include installations of highest electrical efficiency on energized or non-energized conductors as large as 636 MCM ACSR. Kearney two-piece aluminum tap connectors accommodate large conductor sizes from 266.8 MCM through 636 MCM ACSR. Tap units slide into and interlock with an encircling sleeve unit. Sleeve for any one conductor size will accept interchangeably various tap units of the same size range. Kearney interlock design aids installation . . . insures uniform compression and full-circumference contact . . . eliminates strand cutting. Sufficient connector mass without excess weight assures cool-running connections. Interchangeability of tap units helps reduce storekeeper inventories.

Also illustrated: Kearney Cast Aluminum Terminals, accommodating wire sizes from #2 ACSR to 1000 MCM Str.; Aluminum Squeezons for wire sizes from #6 Solid to 397.5, line or tap.

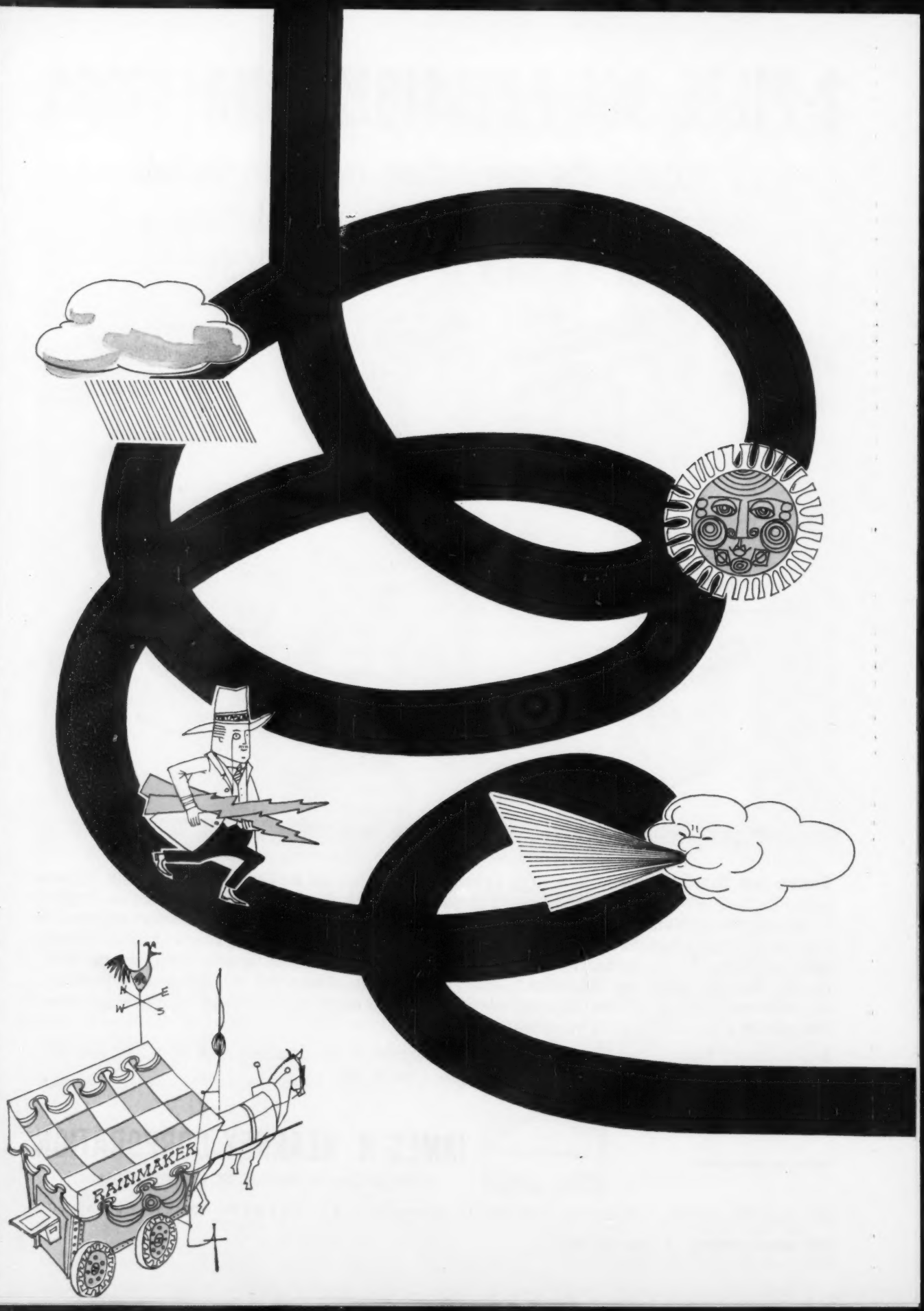
sales representative . . .

KEARNEY

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

CLARINDA, IOWA • GUELPH, ONTARIO, CANADA • ST. THERESE, QUEBEC, CANADA


N
E
W
S
RAINMAKER

The difference in electrical cable starts with a rainmaker

You can't predict the weather but you can be sure USS Tiger Brand Cable has built-in weather resistance. In our research laboratory we create the worst possible weather conditions—baking sun alternated with driving rain—just to see how much torture a cable can stand. A few hours in our weather-ometer is the same as years of actual service. After this accelerated aging, we thoroughly test all the insulating and jacketing materials used in Tiger Brand Cable. We check for cable stability, tensile strength, elongation and flexibility. A microscopic examination checks for crazing and cracking. Various chemicals, micro-crystalline waxes and other antiozonants are then added to the insulating compounds to reduce ozone cutting and increase weather resistance.

This is just one of the many ways our Research and Development Department makes sure the quality of USS Tiger Brand Wire and Cable is the best you can get. Our research laboratory tests all materials used in Tiger Brand products. We experiment with new materials and methods to make Tiger Brand Wire and Cable even better. We have the facilities, right in our laboratory, to make all kinds of experimental cables—from control cable up to high voltage cable.

That's why, whatever the job, it pays to specify USS Tiger Brand Electrical Wire and Cable. You can't buy better cable. American Steel and Wire, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

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American Steel and Wire
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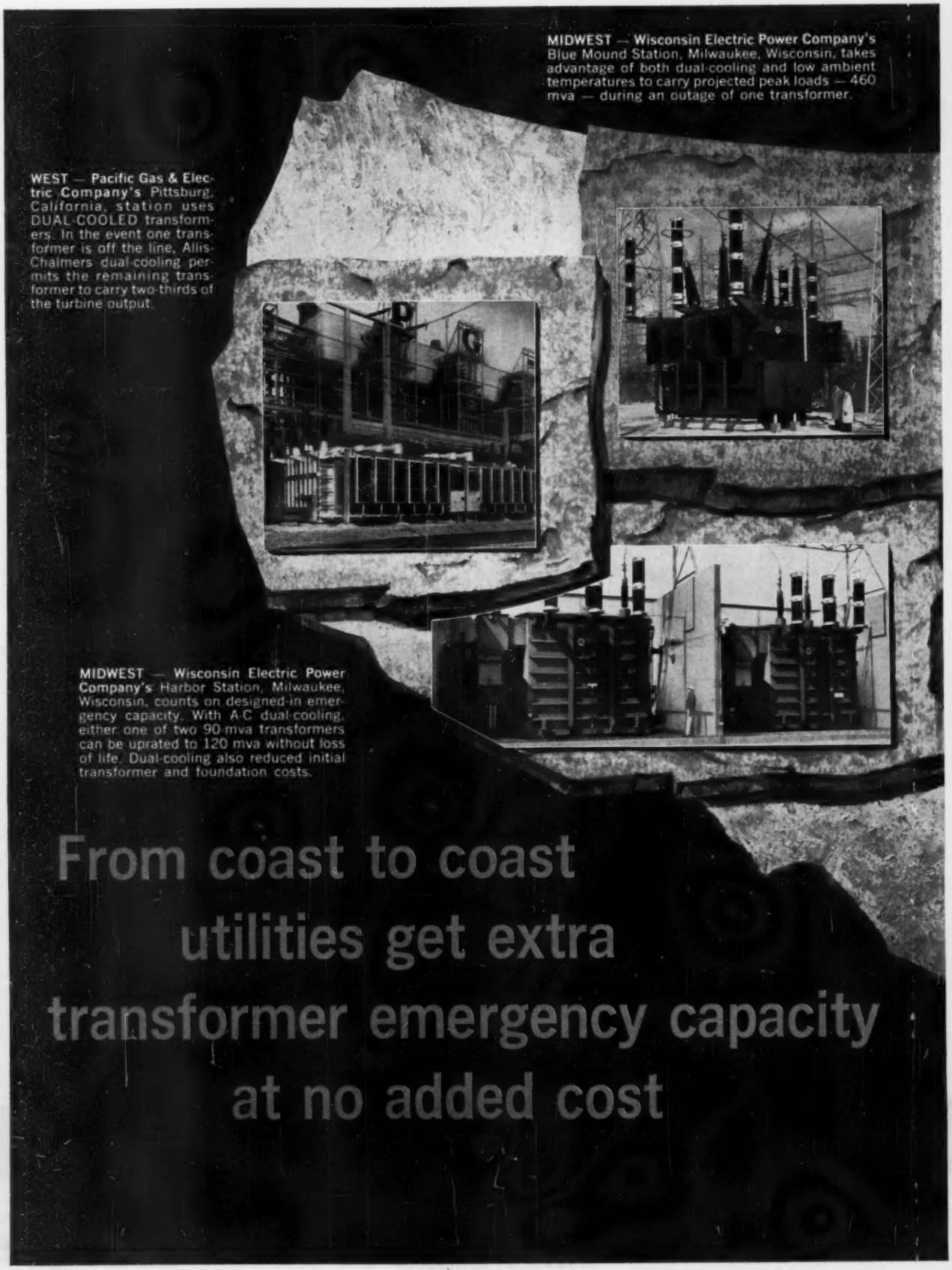
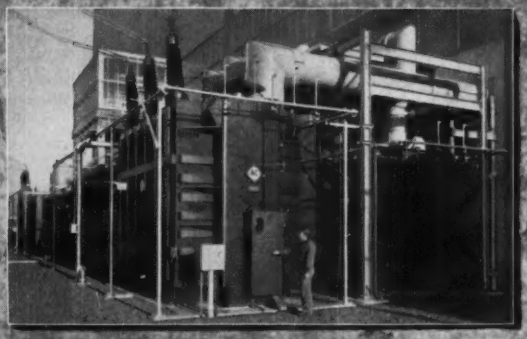


MIDWEST — Wisconsin Electric Power Company's Blue Mound Station, Milwaukee, Wisconsin, takes advantage of both dual-cooling and low ambient temperatures to carry projected peak loads — 460 mva — during an outage of one transformer.

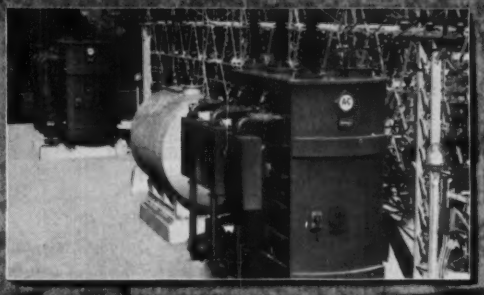
WEST — Pacific Gas & Electric Company's Pittsburg, California, station uses DUAL-COOLED transformers. In the event one transformer is off the line, Allis-Chalmers dual-cooling permits the remaining transformer to carry two-thirds of the turbine output.

MIDWEST — Wisconsin Electric Power Company's Harbor Station, Milwaukee, Wisconsin, counts on designed-in emergency capacity. With A-C dual-cooling, either one of two 90-mva transformers can be uprated to 120 mva without loss of life. Dual-cooling also reduced initial transformer and foundation costs.

From coast to coast utilities get extra transformer emergency capacity at no added cost



EAST — **Philadelphia Electric Company's** Eddystone Station has twin A-C 200-mva DUAL-COOLED transformers that jointly carry the output of one generator. With inter-connected manifold-cooling, one transformer can carry practically the entire load of the generator if the second transformer is out of service.



SOUTH — **Gulf Power Company's** Bayou Chico Substation, Pensacola, Florida. Previously applied on only larger transformers, A-C dual-cooling offers economies for smaller units too. Here, either of two 20,000-kva DUAL-COOLED transformers can be uprated to 26,667 kva.

DUAL-COOLED transformers boost emergency capacity without loss of life! Throughout the nation more and more utilities are turning to DUAL-COOLED transformers as an economical new way to get central station and substation emergency capacity. DUAL-COOLED transformers—an Allis-Chalmers development—utilize a bank of two or more transformers. During an emergency, while one transformer is off the line, its cooling equipment is connected to the functioning transformers. Result: Capacity of any DUAL-COOLED transformer can be increased over its normal rating. *Dual-Cooled transformers is an Allis-Chalmers trademark* A-1468

FOR DETAILS CALL YOUR NEARBY A-C OFFICE OR WRITE

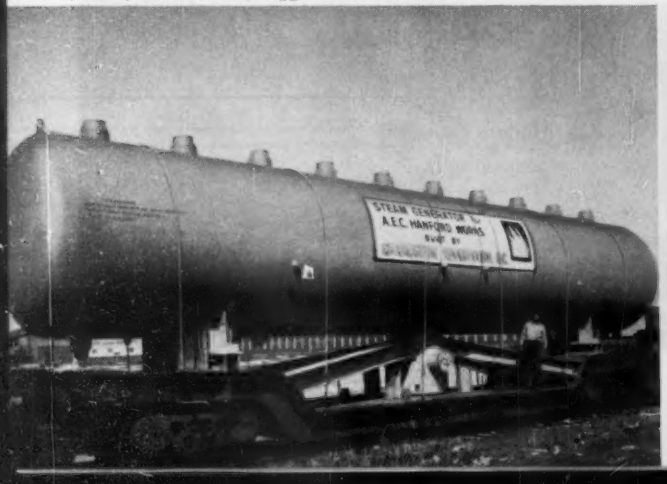
ALLIS-CHALMERS

POWER EQUIPMENT DIVISION, MILWAUKEE 1, WISCONSIN

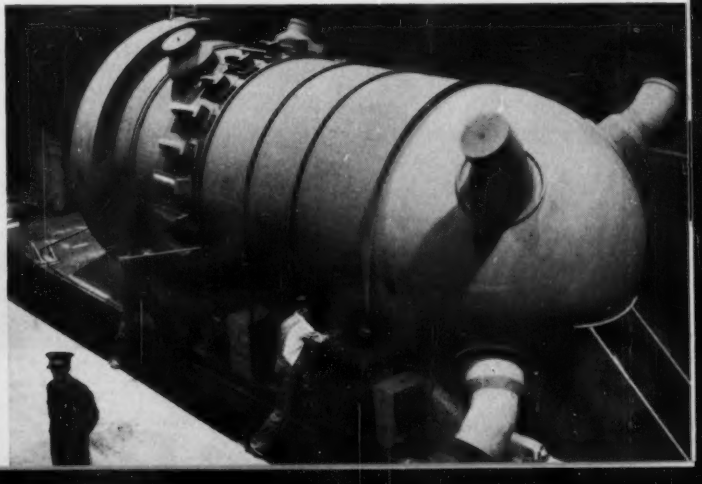
This steam generator, being assembled in a C-E shop, is one of ten on order for the Atomic Energy Commission's New Production Reactor, Hanford Works, Richland, Washington. Designed and built by C-E, each generator is 10 feet in diameter, 57 feet long, weighs 170 tons and contains 20 miles of stainless steel tubing. (See below.)

Designed and Built by

Loaded aboard a special, heavy duty flatcar, a completed steam generator begins its trip to Hanford (see photo and caption above). If all ten units are used to generate power, Hanford will be the world's largest nuclear power plant with a capacity of about 700,000 KW.



The reactor vessel for the country's first commercial (PWR) nuclear power plant is shown here prior to its trip to Shippingport. This 250 ton, 8⅜-inch-thick vessel was designed and built by C-E.



The steam generators and reactor vessels pictured here are representative of Combustion's ability to serve the nuclear field in the design and manufacture of heavy nuclear components.

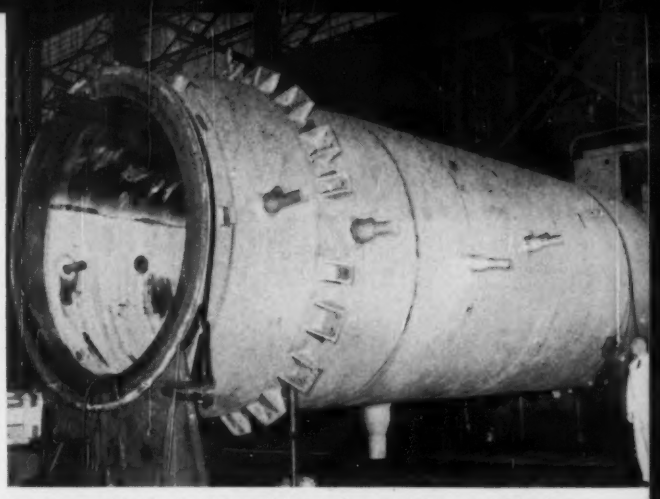
But C-E experience in this area is not limited to the units illustrated. For instance, current C-E work includes the design of the reactor vessel for Italy's first commercial Boiling Water Reactor (SENN); the design and fabrication of the reactor vessel for the 50 emw BWR for the Consumer Power Company's Big Rock Point Plant; the design and fabrication of the reactor vessel for the world's largest PWR, the 375 emw plant of Southern California Edison Company. The "Southern Cal" vessel will weigh-in at about 450 tons, will stand 43 feet high, will be 10¼ inches thick and will have a diameter, over flanges, of about 15 feet.

In addition to this work for the electric utility industry, C-E has been a major component supplier to the U.S. Navy, having designed and built reactor vessels for a number of nuclear powered submarines, the Aircraft Carrier Enterprise, the Cruiser Long Beach, and the Frigate Bainbridge.

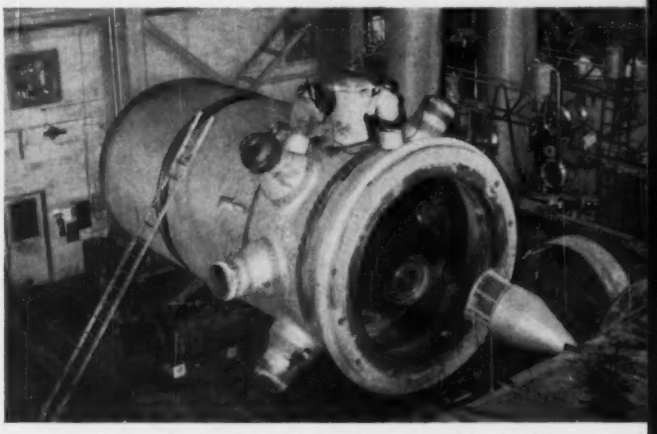
C-E has the personnel, the facilities and the know-how to design and build components of all kinds. It specializes in those which are large, heavy or thick—those which require a high degree of finish—those which are extremely complex—those made of stainless steel or special alloys —or those which must be surgically clean or optically flat.

C-E heavy duty dock loading facilities, adjacent to the plant on the Tennessee River, allow the economical shipment by water of very heavy components (in excess of 400 tons). All coastal points and many inland cities can be reached via the inland waterway system and without clearance restrictions.

For further information, write to your nearest C-E office or to Nuclear Component Sales in Windsor, Conn.



Reactor vessel for Pacific Gas and Electric Company's 50 emw Boiling Water Reactor Plant at Humboldt Bay. This 140 ton vessel is 10 feet in diameter and 42 feet long. It was designed and is being built by C-E.



Hydro caps being welded to the nozzles of the reactor vessel for the 180 emw Pressurized Water Reactor for SELNI (Societa Elettronucleare Italiana) in Italy. This vessel, designed and built by C-E, has a shell thickness of 9⅝-inches and weighs 285 tons.

Combustion

Made entirely of stainless steel, this reactor vessel is part of the Liquid Sodium Cooled, 100 emw, Fast Breeder Reactor system of the Atomic Power Development Associates at Lagoona Beach, Michigan. One of the most complex vessels ever built, it weighs about 380 tons, including its rotating plug. It was designed and built by C-E.

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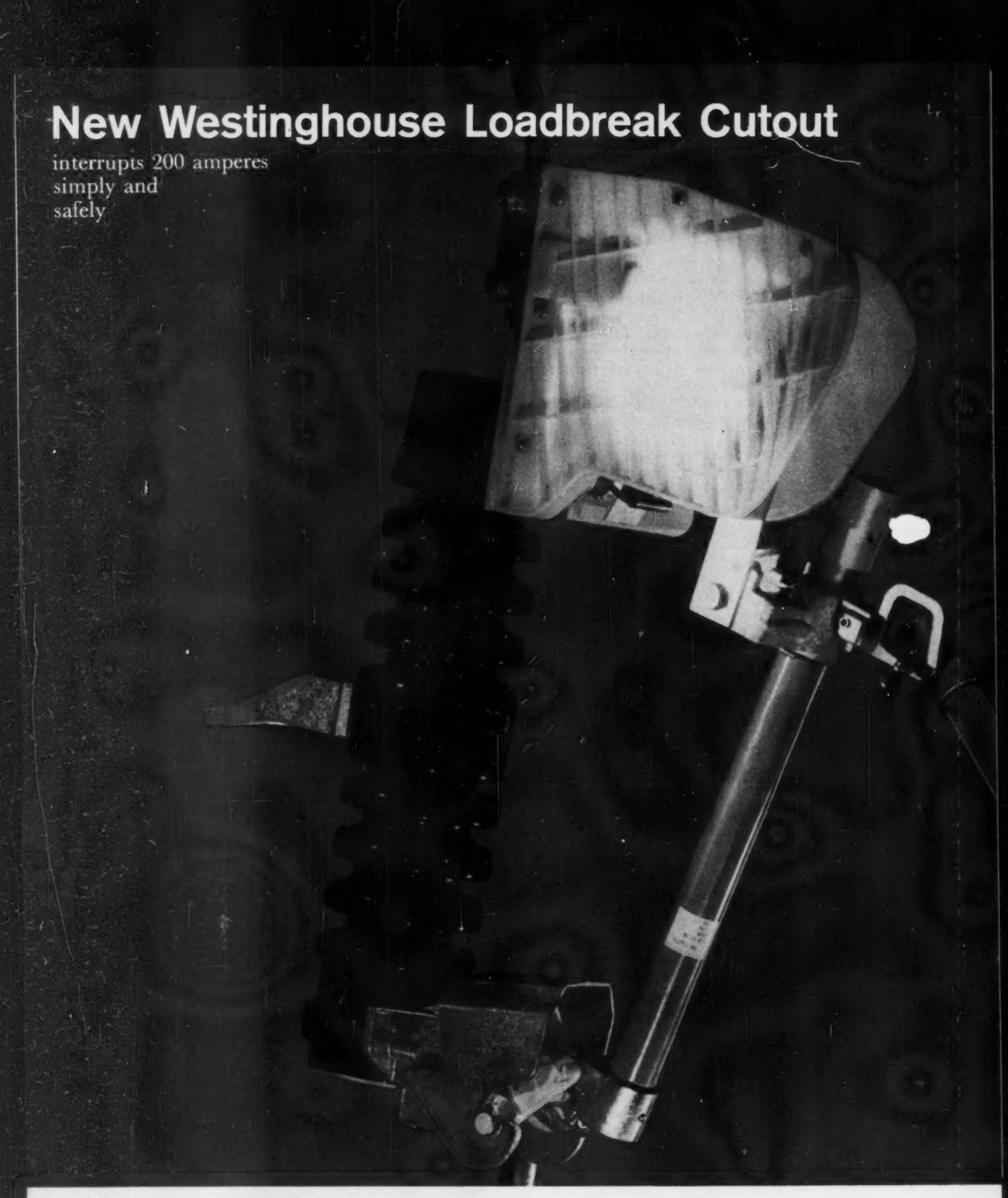
ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

New Westinghouse Loadbreak Cutout

interrupts 200 amperes
simply and
safely



Open it safely

arc is confined within chute. The LBU is a self-contained cutout capable of breaking high load currents repetitively and is priced only $2.50 to $3.50 more than a standard open cutout. No special operating tools required; merely open in the conventional manner. No fuse link or gas bottle to replace—arc chute will last the life of the cutout.

Development of a new thermoplastic with exceptional nontracking quality, Delrin,* was the big arc-chute design break-through. When the blade is opened, a de-ionizing gas is generated from the thermoplastic by the arc heat. The gas, aided by the fast snap action of the blade, quickly extinguishes the arc within the chute, completing the simple yet safe loadbreak operation.

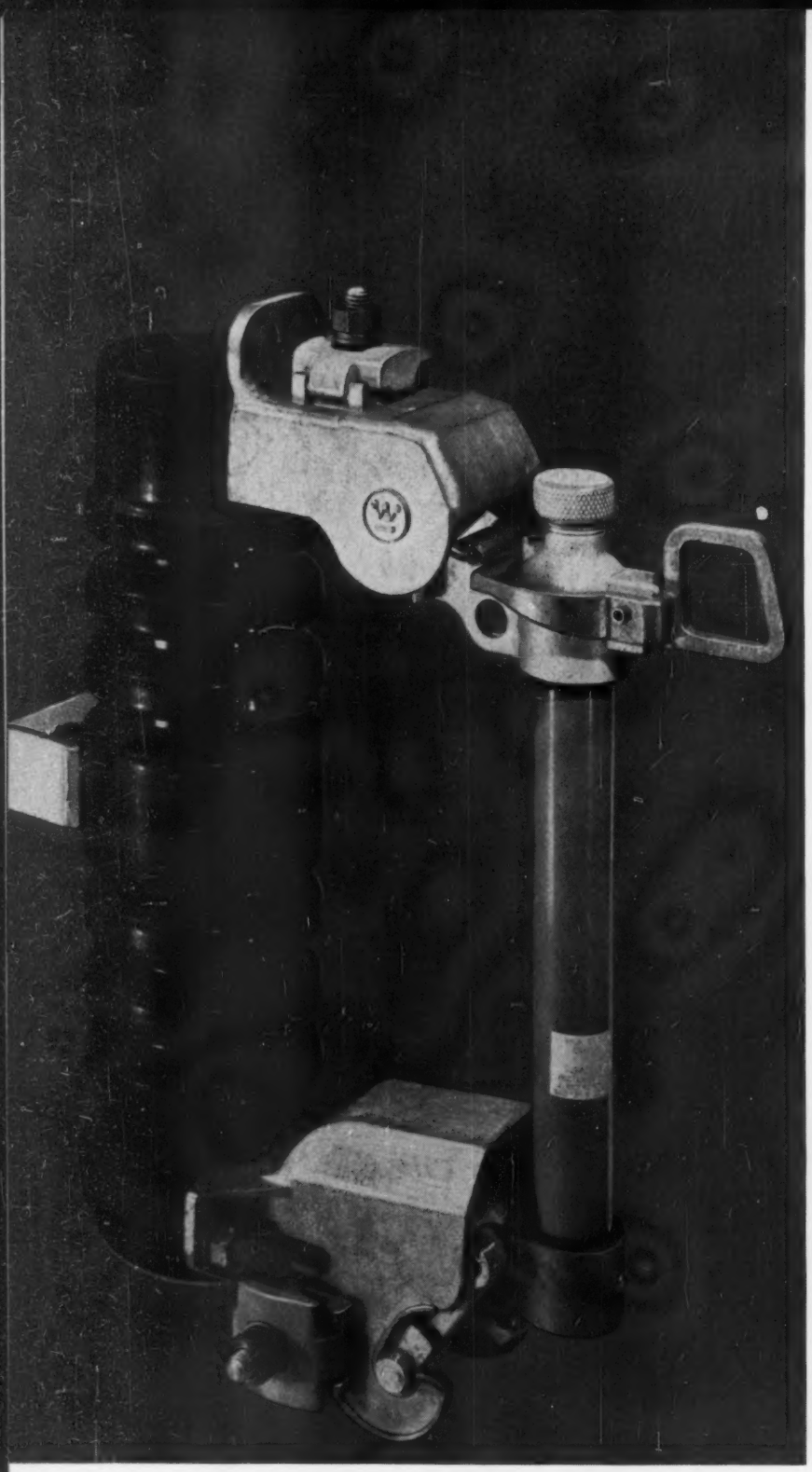
J-65000-1

*Trademark of Du Pont

Close it simply

After 200 laboratory loadbreak operations, at full interrupting rating, with no maintenance, the arc chute showed negligible wear and only slight discoloration. The newly-developed thermoplastic arc chute has been completely tested, including ice test and accelerated weather test. Extremes of *temperature and sunlight* have no deteriorating effects.

also ▶



Positive latching of the top contact, to prevent accidental opening. The cutout can only be opened by pulling down on the hookeye.

Cam action on the closing mechanism to reduce side-to-side movement when closing the cutout, yet to provide maximum clearance for rehanging fuse tube.

Spring loaded flipper, to help eject the fuse pigtail during a fault interruption and also to provide a positive latch for the bottom toggle mechanism.

Large wingnut with non-rotating washer and snubbing post, to clamp fuse pigtail with no slippage or fraying.

Heavy duty or extra-heavy duty service, for a wide range of fault current interruption requirements.

Tin-plated clamshell type terminals, suitable for aluminum or copper conductors from No. 8 to 4/0 ACSR.

Silver-plated contacts, to reduce temperature rise.

All parts made of non-ferrous materials, for long life under all atmospheric conditions.

LBU LOADBREAK FUSE CUTOUT RATINGS
15 KV—100 amp continuous current rating, with 200 amp loadbreak rating. (Equipped with an arc chute capable of interrupting 200 amp load at wide ranges of power factor.)

	NEMA Interrupting Rating RMS Asymmetrical Amps
Heavy duty, solid cap	4000
Heavy duty, exp. cap	8000
Extra heavy duty, solid cap	8000
Extra heavy duty, exp. cap	16000
Disconnect (200 Amp)	—

LDX OPEN FUSE CUTOUT RATINGS
100 amp continuous current rating

	NEMA Interrupting Rating RMS Asymmetrical Amps	
	7.8 KV	15 KV
Heavy duty, solid cap	5000	4000
Heavy duty, exp. cap	10000	8000
Extra heavy duty, solid cap	10000	8000
Extra heavy duty, exp. cap	20000	16000
Disconnect (200 Amp)	—	—

a new open cutout

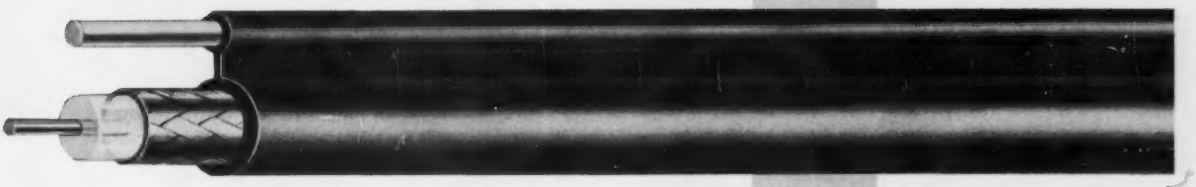
On both the LBU Loadbreak and the LDX Fuse Cutouts, you get all the design features listed at the right.

For complete information, call your Westinghouse Sales Engineer. Or, write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-65000-3

Westinghouse

COST-SAVER FOR TV SYSTEMS



SUPERIOR I.M. Coaxial Distribution Cable

Here's an aerial coaxial cable with the support wire constructed as an integral part of the cable jacket!

Eliminates the need for separate messenger—speeds installation! The overall jacket is high molecular weight polyethylene. SUPERIOR I.M. (Integrated Messenger) Coaxial Distribution Cable provides maximum efficiency and economy for use with Community TV, Educational TV, Closed Circuit Industrial TV, Closed Circuit Entertainment Systems, and other high frequency applications.

For more information, write

SUPERIOR CABLE

SUPERIOR CABLE CORPORATION, HICKORY, NORTH CAROLINA

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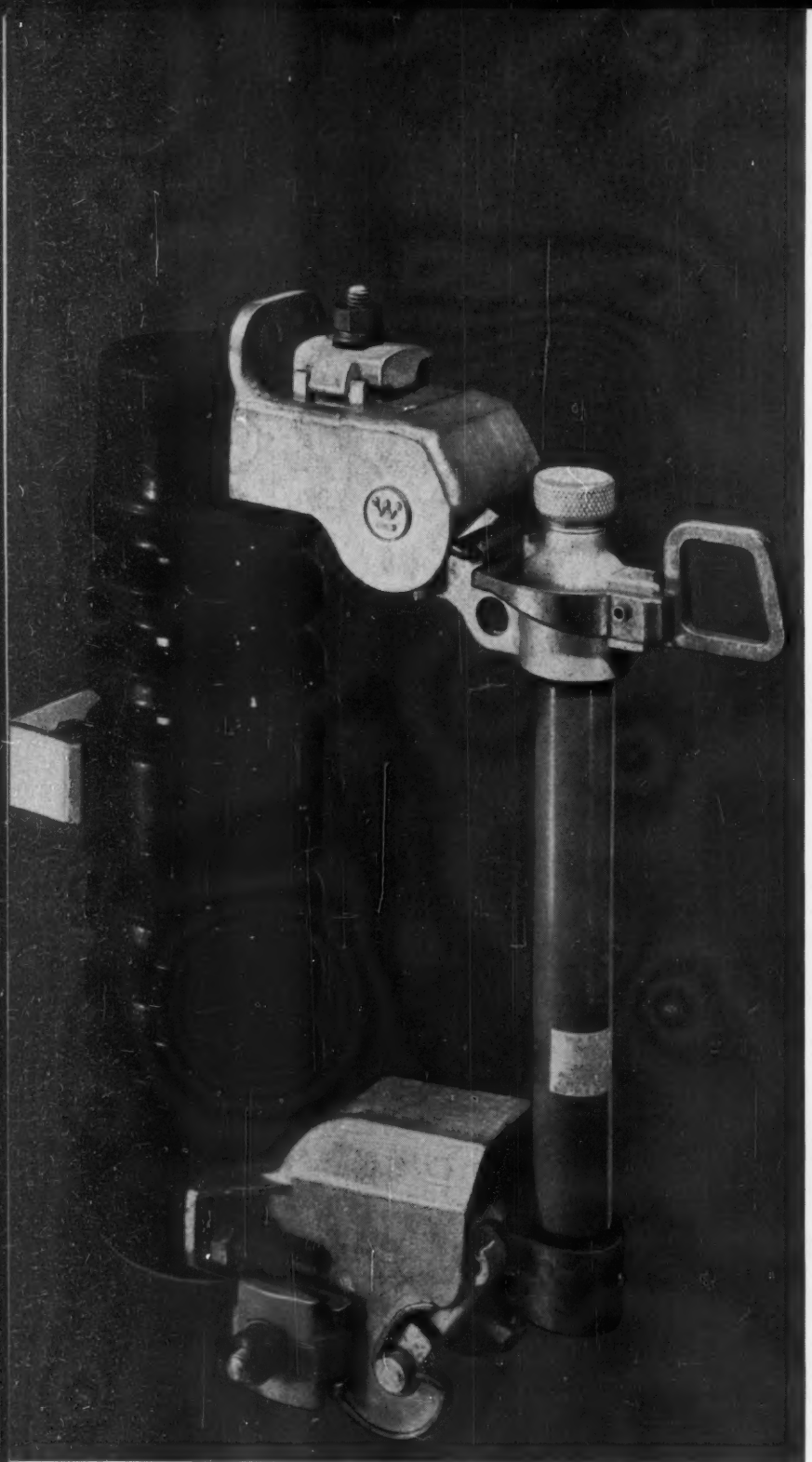

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100 amp continuous current rating

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Heavy duty, solid cap	5000	4000
Heavy duty, exp. cap	10000	8000
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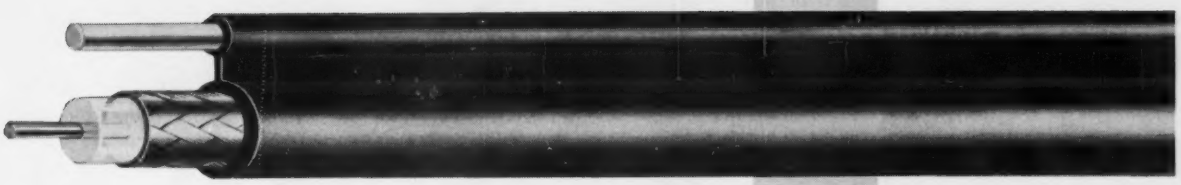

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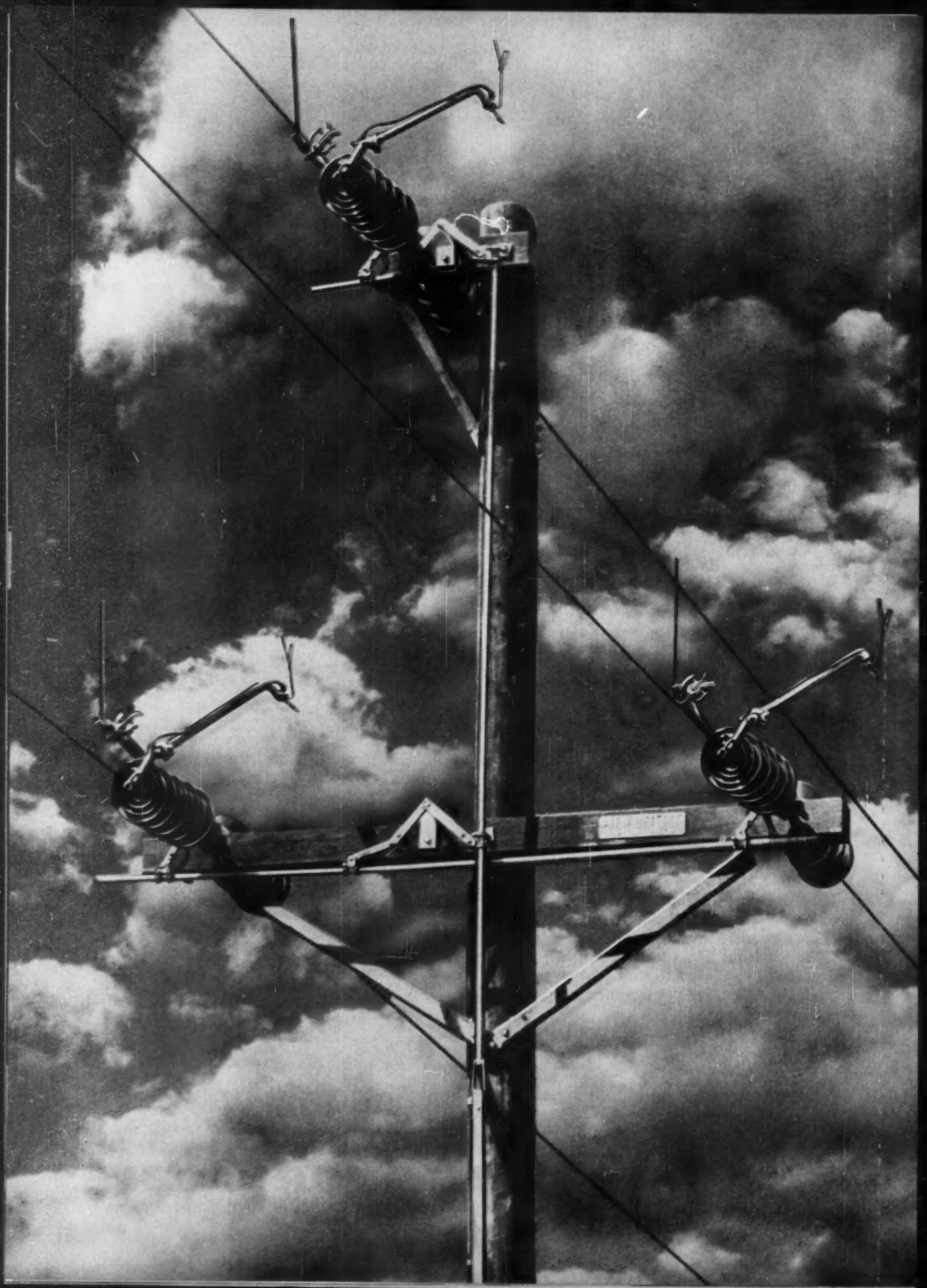

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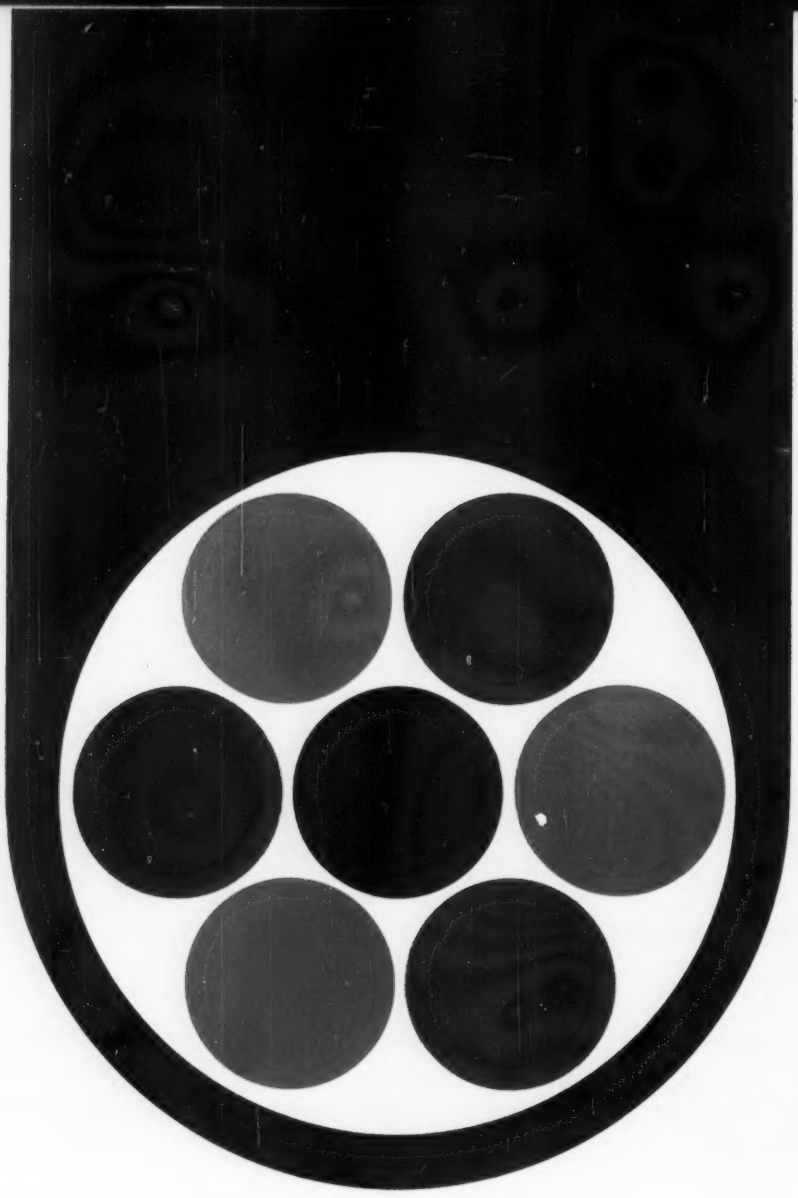

NEW WAY TO EVALUATE CABLE!

"VALUE RATINGS" RELATE PERFORMANCE TO IPCEA OR COMPETITIVE STANDARDS

New Value Ratings tell at a glance the composite story of each Kaiser Wire construction—as it performed in as many as 25 specified tests. In each case a well-known standard serves as 100%:

For power cable, the Value Rating standard is all IPCEA test requirements for types of insulation and jacketing specified . . . For portable cord, the standard is service-per-dollar for the least expensive cord (C.V.) as proved by life-expectancy tests. . . . For control cable, the standard is a composite of minimum requirements for eight important insulation qualities.

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For details and Value Rating listings, ask your Kaiser Wire Distributor for free K/W Value Rating Bulletins, or write: Kaiser Wire, Room 844b, Kaiser Aluminum & Chemical Sales, Inc., Kaiser Center, 300 Lakeside Drive, Oakland 12, California.

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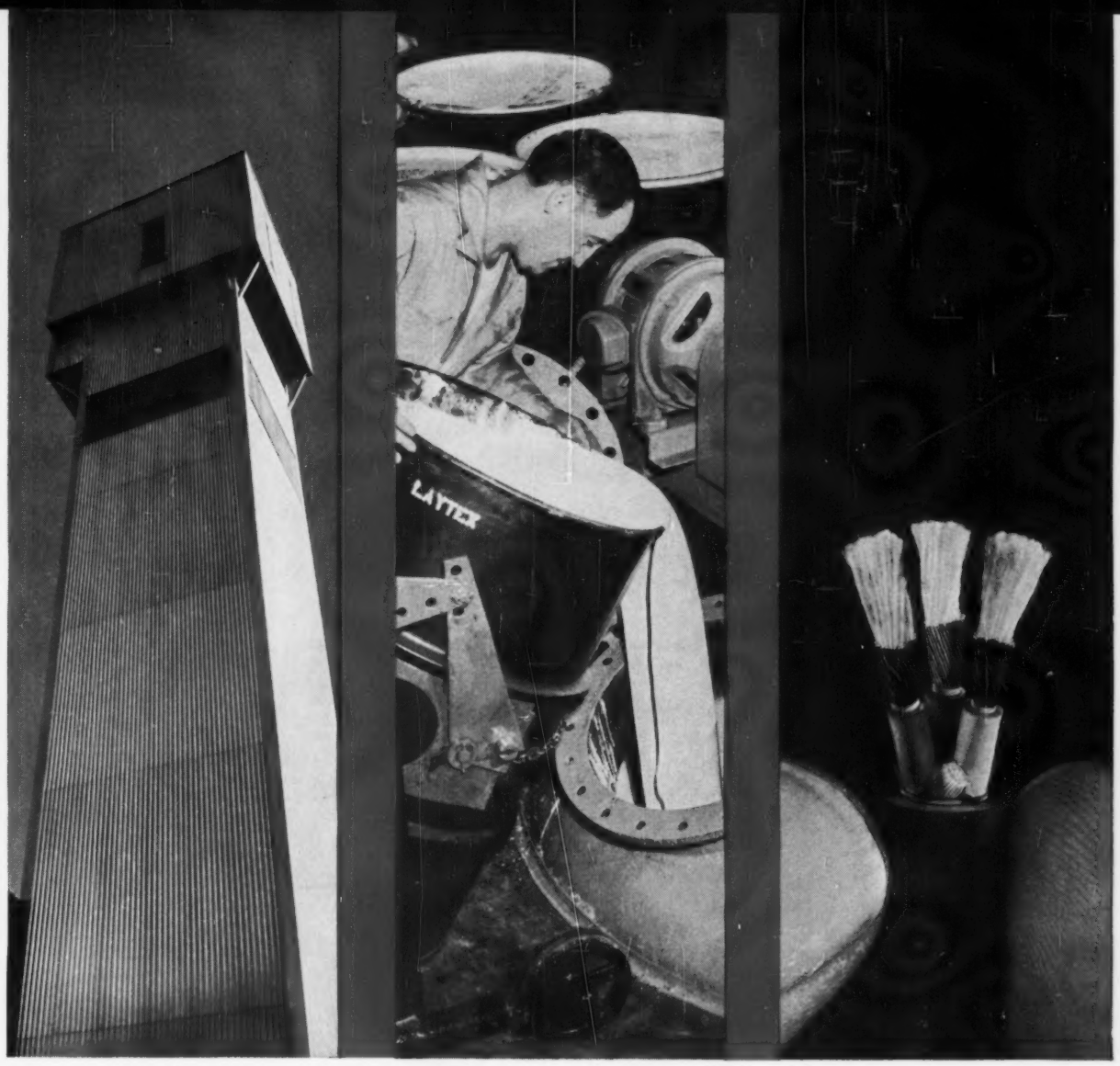

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K/W GRIZZLY® POWER CABLE SPEC. 831
VALUE 270% RATING

MIRACLE OF LIQUID LATEX GUARDS KAISER LAYTEX® CONTROL CABLES

Coat after coat of liquid latex—applied in 100-foot vertical runs—gives K/W Laytex-insulated control cables unequalled value. The patented Laytex insulation process is the only one that applies virgin liquid rubber with its "liveliness" untouched by drying-regrinding cycles. Vertically applied concentric coatings eliminate any chance of weak, thin spots. Vulcanized Laytex has a remarkable insulation resistance constant of 75,000; typical tensile strength of 4,500 psi.

K/W LAYTEX-RESIN CONTROL CABLE
VALUE 767% RATING

KAISER FIBROUS CORE HELPS THIS CORD FLEX 12 TIMES LONGER

A patented "cushion" core of soft fibre —at the center of the twisted copper conductor itself — is one reason why K/W Master Laytex portable cord survived 1270% more flexing cycles than the average low-priced product (C.V.) . . . 488% more than high-grade mold-cured competitive cords. Flexing is one of eight qualities adding up to *five times greater life* for K/W Master Laytex cord. In service per dollar this means 308% as much value as low-priced C.V.

K/W MASTER LAYTEX PORTABLE CORD
VALUE 308% RATING

IN COPPER AND ALUMINUM CABLES... THE SPARK OF QUALITY IS KAISER WIRE EXPERIENCE! KAISER ALUMINUM

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Like electricity, supplies from Graybar cost you nothing until you need them. And - also like electricity - they're available to you all the time. ■ When you need anything - pick up the phone and call us. Since there are large stocks in over 130 local service centers all over the country, we're pretty sure to have on hand what you're looking for. ■ Better yet, if you let us work with you to develop a planned purchase program - you can count on same-day delivery of probably 95% of the supplies you order. So why not let us talk it over with you? We'll stock what you need; you'll get it - and pay for it - only when you need it. It's another reason why you should call Graybar - for everything.

Graybar Electric Co., Inc.: local service to utilities through coast-to-coast warehousing.

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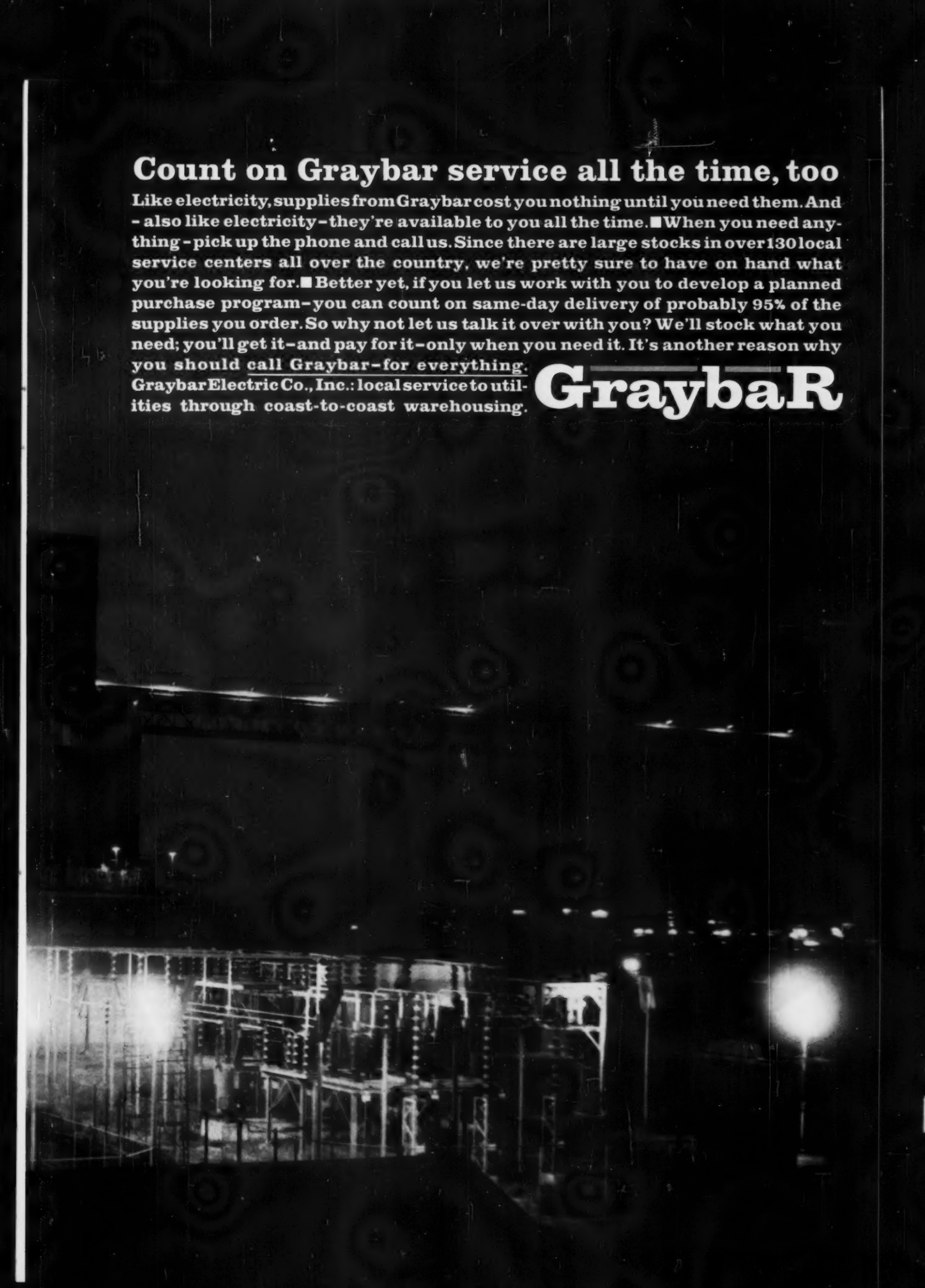

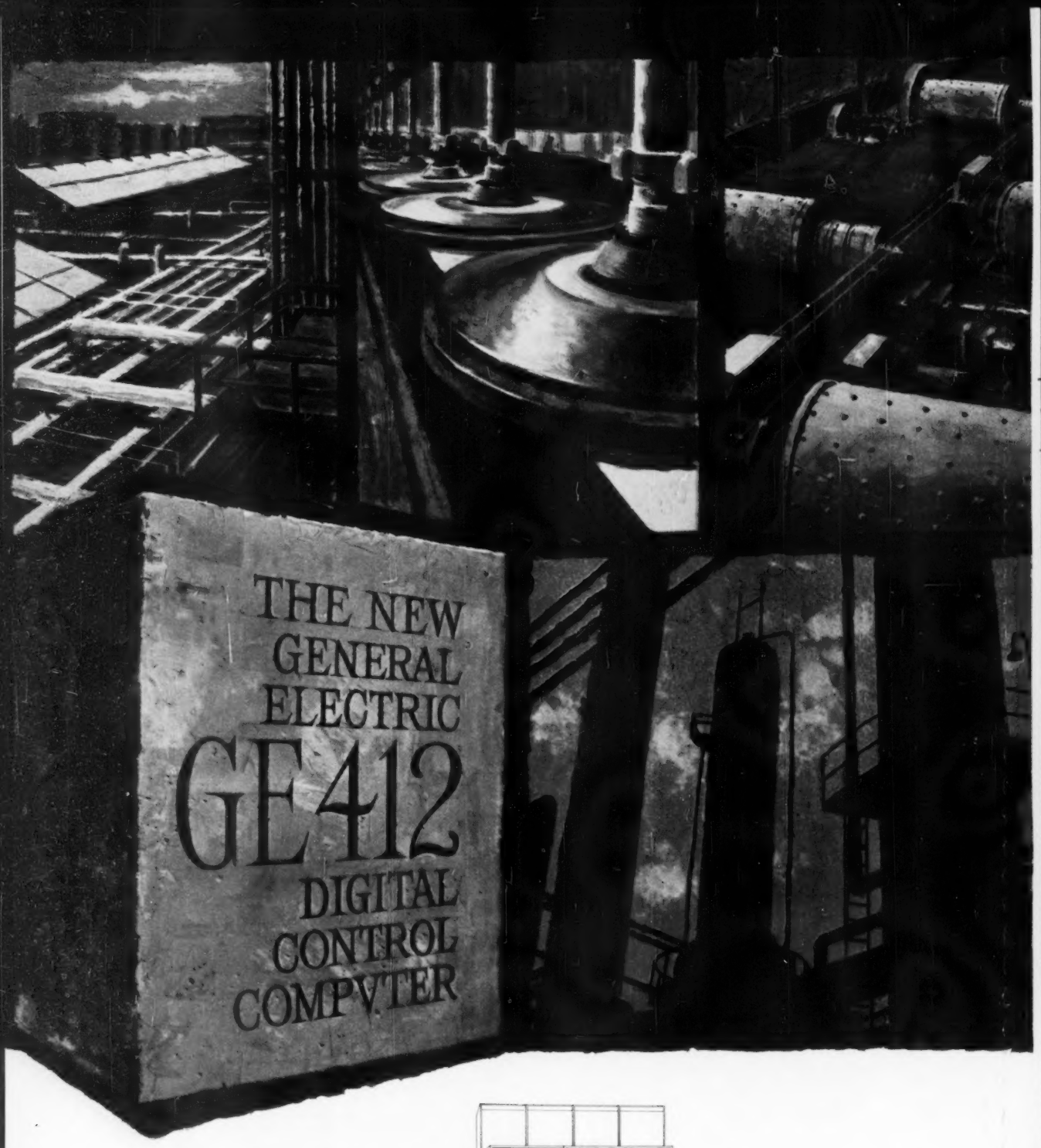

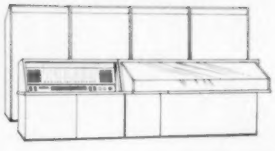

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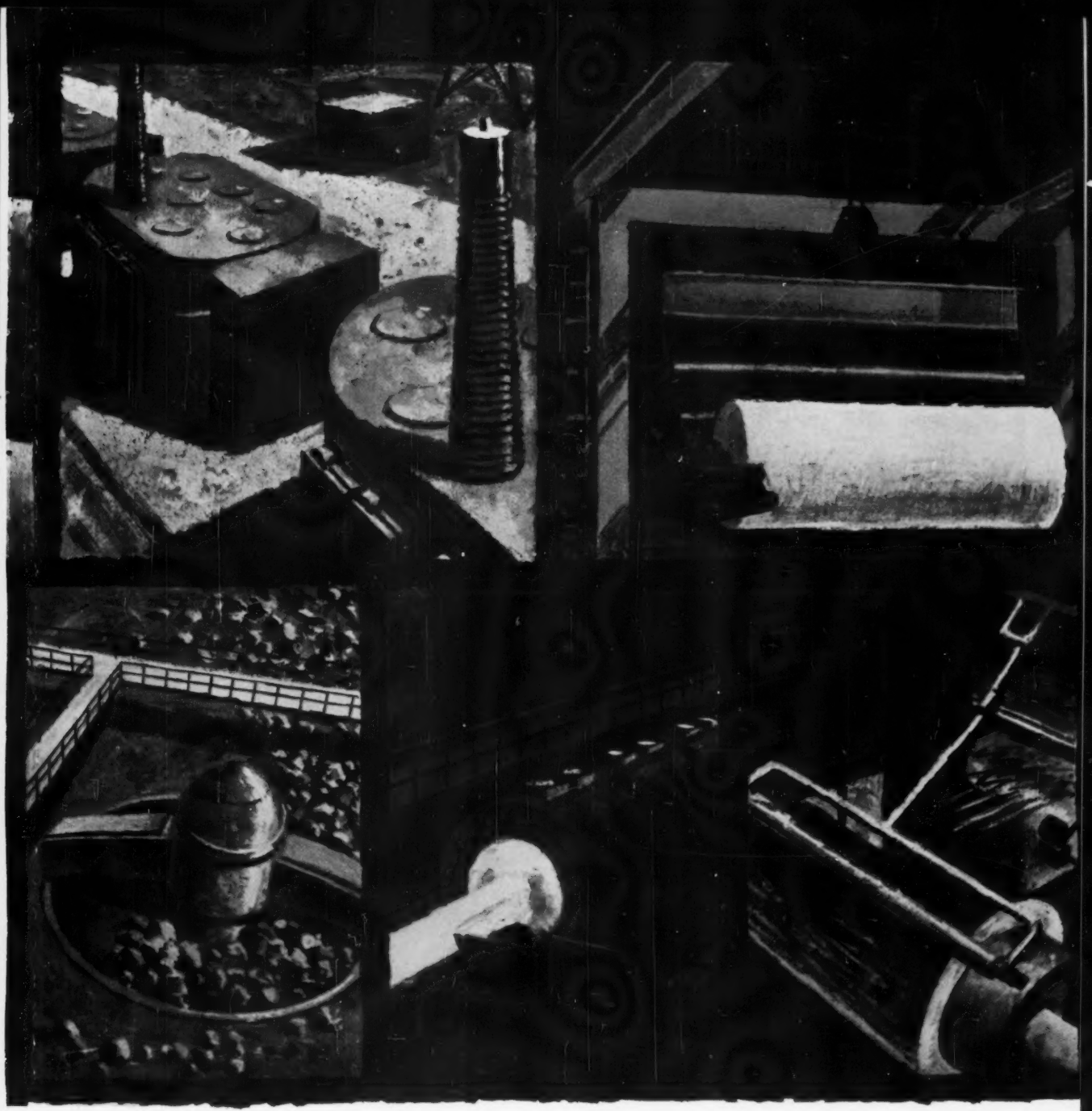
General Electric announces the new GE 412, a second generation solid-state, stored program computer designed solely for industrial and utility applications.

The GE 412 Digital Control Computer, new "big brother" in the General Electric family of process computers, has been designed with the total systems concept and flexibility of equipment organization in mind.

PCA-2



The resultant versatility and capability of the GE 412 makes it custom-adaptable to many particular applications in many varied industries—data-logging and monitoring, data-logging and control, economic dispatching, director (or dispatcher) in a multi-control system.

The new GE 412 is extremely fast—capable of 25,000 additions a second. It incorporates a core memory with drum memory backup, plus more than 100 basic commands, to provide wide programming flexibility. The Automatic Program Interrupt feature and Programmable Elapsed Time Counters permit the regular survey of critical points without wasting valuable computer time required for constant checking.

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General Electric engineers can detail the available full line of input/output equipment and computer services including SYSTEM DESIGN, PROGRAMMING and AIDS, TRAINING, INSTALLATION SERVICES, and MAINTENANCE SERVICES—offered by General Electric to get your automation program in operation quickly... for lower production costs, increased profits.

INVESTIGATE THE NEW GE 412—*contact your nearest General Electric Apparatus Sales Office or the Process Computer Section, Industry Control Department, P.O. Box 2918, Phoenix, Arizona.*
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This is Tucson, Arizona, where the sunshine sparkles day after day, all year round.

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Little wonder Tucson has grown from 262nd to 54th in rank among U.S. cities in the past ten years.

Tucson lies athwart the main line of one of the nation's leading railroads . . . and is served by an outstanding and fast-growing modern utility whose offices are circled in the photo above.

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Editorial Comment

JUNE 26, 1961

REA Loan to Hoosier Has Important Safeguard

The record $60.2-million loan which the Rural Electrification Administration has approved for Hoosier Cooperative Energy, Inc, can be validated only by a certificate from the Indiana Public Service Commission (p 42).

Both the Governor of the state and a spokesman for the Commission have promised a full and fair study of the loan to determine whether it will be to the best interest of all the people in the state.

We believe this review by a state commission is healthy for a number of reasons:

First, it will serve to inform the public of the economics of the loan and other pertinent facts in the case. In some 29 other states it is possible for a cloak of secrecy to obscure such material from the general public.

Second, it will give a local regulatory body a chance to consider the effects of the proposal on the local area generally—a procedure that is more difficult from the REA offices in Washington.

Third, it subjects this borrower to the same regulatory procedures as apply to investor utilities in the state.

We believe that the safeguard of a commission review may very well work to the benefit of the cooperative members, other utilities operating in the state, as well as federal taxpayers in all states.

Fermi Decision Should Smooth Utility Planning

The US Supreme Court's favorable decision on Enrico Fermi Atomic Power Plant is a salutary event (EW, June 19, p 50). As we said in an editorial a year ago (EW, June 27, 1960, p 37), this was a matter that needed to be tested in the courts. The decision seems to leave no unresolved points.

In affirming the Atomic Energy Commission's jurisdiction and responsibility and in permitting the Power Reactor Development Co to proceed, the decision has ended a tenuous situation for the utilities building reactors and for prospective builders as well. It is also likely to improve public acceptance.

Some changes in the nuclear power picture may have resulted from this litigation even before a decision was reached. The AEC has, for instance, focused more on determining safety at hearings prior to construction.

The result regarding the over-all siting situation, we should notice, is not really a step forward but rather the forestalling of a possible step backward. For, though the decision has cleared the siting question for the Fermi plant, on the broad scene it has only ended apprehension that an adverse decision might have jeopardized other plants, including those yet in planning.

This is the second bit of welcome news in nuclear power in two weeks. The first was the Commission's announcement of a July 1 reduction in enriched-uranium prices. The combined effect of the two could well be felt in utility planning.

Hoosier Loan Praised and Panned

Hoosier G&T co-op plans to 'proceed as rapidly as possible' to build 198-Mw plant; investor-owned utilities in area feel present supply is ample and price to co-ops fair

"One of the first fruits of the New Frontier." That's what REA Administrator Norman Clapp called the record-breaking $60-million loan to Hoosier Cooperative Energy, Inc, to build a 198-Mw steam station and 1,500 miles of transmission line. Hoosier Cooperative Energy is composed of 16 REA-financed distribution cooperatives in Indiana.

Frank E. Ratts, manager of Southeastern Indiana Rural Electric Membership Corp, Osgood, and coordinator for HCEI, said that the G&T co-op "will proceed as rapidly as possible" to build the 198-Mw plant on a 118-acre site on the White River near Petersburg in the midst of a strip coal mining area. In-service dates for the three 66-Mw units will depend upon the granting of a certificate of convenience and necessity to HCEI by the Indiana Public Service Commission.

The 16 distribution co-ops buy 94% of their power from Public Service Co of Indiana; 4% from Southern Indiana Gas & Electric Co. The co-ops, in effect, plan to build their own G&T system and cut away from the investor-owned supply, Ratts said.

Secrecy Criticized

Reached for comment, spokesmen for investor-owned companies said "When the application for the loan was filed with REA, we could not get a look at it. Therefore, it is too early to comment on what action might be taken, but the investor-owned companies in Indiana will get together to discuss possible action." In reply to press inquiries, C. H. Blanchar, president of Public Service Co of Indiana, said, "Except for the information received from the press, we have no knowledge of the Hoosier Cooperative Energy, Inc, loan authorization today made by REA . . . This has all been done secretly by REA and no public hearings have been held nor has any factual information been given to the taxpayers or any other interested parties.

"As we have repeatedly stated, we have ample electric generating capacity to serve all the present and prospective needs of the Hoosier cooperative group. Adequate transmission facilities are already in existence and now supply the energy to co-op distribution systems. All this is being done at a fair price."

Electrical World learned that action will not be taken until the Hoosier group petitions the Indiana Public Service Commission for authorization to proceed. The REA loan is contingent upon commission approval of the plans.

Indiana's Democratic Gov Matthew E. Welsh, who appointed the commission, made a campaign issue of the opposition of the last Republican commission to the loan.

Welsh promised June 15 that the commission "will zealously guard the full legal rights of the private utilities and the public." Merton J. Stanley, commission chairman, assured it would give "careful and impartial consideration" to the petition of Hoosier.

Public Service Co of Indiana also reported that a recent contract proposed with Tipmont REMC was not approved by REA, although it was approved by the Indiana PSC and is the same contract made with five other co-ops and approved by REA. Power under proposed rates would cost 7.86 mills per kwhr delivered at transmission voltage, and 8.48 mills per kwhr at distribution voltage, both at 95% load factor. The contract includes a 3-mill per kwhr adder for any power sold to the co-op for delivery to a non-farm customer whose monthly usage exceeds 80,000 kwhr. This is the "dual-rate" feature being attacked by REA.

In turning down the contract between Indiana Public Service and Tipmont REMC, Hubert Wales, REA's acting area director, said in a letter to Tipmont:

1. The entire provision relating to large non-farm sales adjustment should be deleted.

2. The ten-year contract term should be changed to five years. The 36-month period for advance notification of intent to terminate the contract after the expiration of the original term should be reduced to a "suggested" six months.

Wales said further, "We are aware that these provisions have been contained in contracts which have been approved by REA. This fact does not render these provisions any less objectionable. It is our feeling that they should be revised, or deleted, as indicated. Under long-term contracts, co-ops are restricted in efforts to improve their power supply situation. Co-ops should be able to investigate development of their own G&T systems and be able to take advantage of possible future public power expansion without the restraint of long-term contracts."

$42 Million First Requested

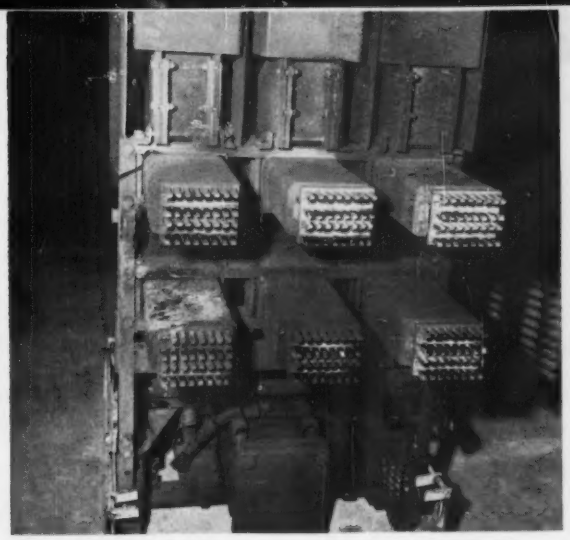
Wales raised these other points:

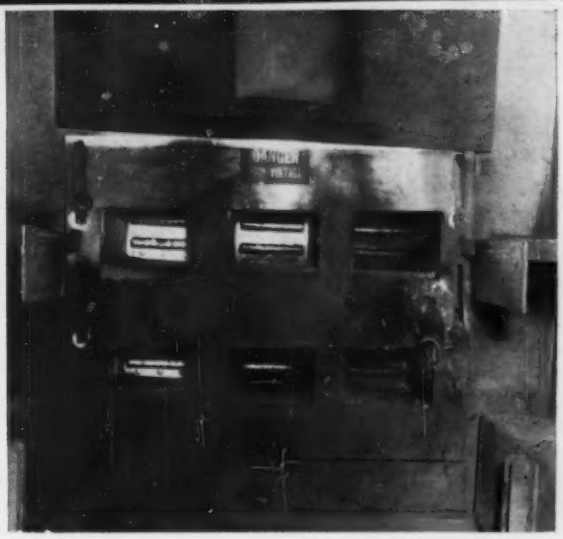
1. The provision whereby the co-op is obliged to accept any rate increase (for the investor-owned utility) by the Indiana commission should be revised to give the co-op the right to terminate the contract in the event of an ordered rate increase.

2. The tax adjustment provision should provide for a rate reduction in the event of reduced taxes (on the investor-owned utility) as well as a rate increase in the event of increased taxes.

The original Hoosier loan application was for $42 million and was submitted in 1957, proposing a 198-Mw plant and 950 miles of transmission lines to serve nine member cooperatives. This application was later withdrawn when a prospective industrial load failed to materialize. The second, or present plan, was filed in August 1959.

The transmission and substation facilities provided by the loan include a 130-Mva substation at Franklin and a 66-Mva substation at Worthington. The 285 miles of 154-kv lines will include a loop from the generating plant to the Franklin and Worthington substations, a 37-mile arm from the plant south and east to the Newton-Stewart area and a 46-mile arm running south and east from the Franklin substation to Napoleon.





BREAKER and cubicle photos by Con Edison show damage to lower left circuit breaker contact which fits into lower right cubicle recess. Damage to cubicle was minor; damage to breaker consisted of one burned-off contact finger

Con Edison T&D System Is Attacked

Consolidated Edison Co's fundamental transmission and distribution system is under fire from New York City Department of Water Supply, Gas and Electricity.

In a report to Mayor Robert F. Wagner, Department Commissioner Armand D'Angelo said that where Con Ed has failed "is in the control and sectionalization of the system for feeding or allocating this power so that in the event of future mechanical or electrical failures, only relatively small areas will be denied energy."

Commissioner D'Angelo's report analyzed the cause of the power outage which cut service in a large section of Manhattan during the commuter rush hour recently. The report absolved Con Ed of any responsibility for the immediate cause of the outage, the failure of two circuit breakers at the utility's West 65th street substation.

"Our investigation," reported D'Angelo, "has determined that these breakers were defective and were the direct cause of the power failure . . . Responsibility for their failure, therefore, rests with the Westinghouse Electric Co, rather than with the Consolidated Edison Co." A Westinghouse spokesman said D'Angelo's statement was "essentially correct." He added, "We are working diligently with Con Ed to develop corrective measures as rapidly as possible."

But D'Angelo did not concern himself with the immediate cause of the failure. "The fact is," he said, "that electrical and mechanical failures *do* occur, and it is incumbent upon the Consolidated Edison Co to guarantee that these failures affect the smallest possible area of our city population when they do occur."

Following the August 17, 1959, blackout in Manhattan, D'Angelo had criticized the Con Ed system on three counts: **(1)** Feeding an area by uni-directional feeders; **(2)** Feeding two areas through bifurcated feeders when bifurcations cannot readily be separated by switching devices; **(3)** Lack of sectionalization. In his current report, he said, "These three basic defects still exist with respect to the distribution of this power."

The report specifically hit Con Ed's use of bifurcated feeders which were responsible for two substations going out two weeks ago even though breaker failure occurred at only one substation.

"So long as the policy and practice of using bifurcated or loop-through feeders exists without a satisfactory method of isolating power failures," D'Angelo said, "this problem will continue."

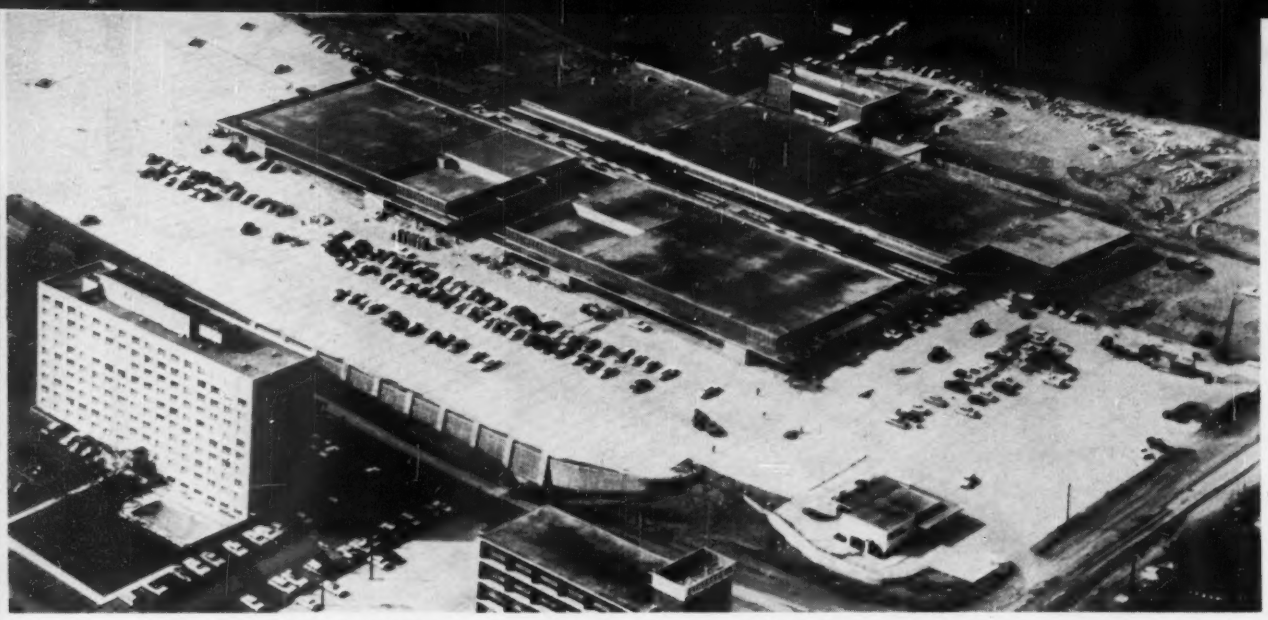
Con Edison, while defending the soundness of its system, announced that it has engaged Stone and Webster Engineering Corp to review the equipment failures of June 13 and to analyze the related operation of the company's electric substations and distribution systems.

"While we are convinced of the basic soundness of our design and operating practices," said Harland C. Forbes, Con Ed's chairman, "we want to be absolutely sure that we have overlooked nothing in our own analysis of the causes of the June 13 blackout and, that in our planning and design for the future growth of New York City electric load, no sensible precaution for insuring reliability is being neglected. A review by the consulting engineers will provide a valuable check upon the company's own observations and conclusions," Forbes stated.

D'Angelo's report also rapped the New York State Public Service Commission. "It is inconceivable to me," he said, "how the Public Service Commission continues to permit this situation." He quoted from the Commission's report on the August 1959, blackout in which the Commission said the results of its inquiry "confirmed the fundamental soundness of the system designed."

"How many more blackouts and how many more near tragedies must we have before the Public Service Commission will recognize that the fundamental transmission and distribution system of the Consolidated Edison Co is not sound?" D'Angelo asked.

The report made clear that the city lacked the power of enforcement and had no lawful right to direct Con Ed to take corrective measures which it believed to be in the best public interest. It recommended that the city be given concurrent jurisdiction with the state in regulating the electric utility "to the benefit of the people of our city."



LITTLE ROCK SHOPPING CENTER uses gas turbines to generate all the electric energy needed on premises

The gas industry's latest push . . .

'Do It Yourself' Electricity

When officials of the Northern Illinois Gas Co move into their new divisional headquarters building next year in Glen Ellyn, they will point with pride to the fact that the building is all gas, even to the extent that electricity for the building is generated by gas turbines right in the basement.

The Northern Illinois Gas building is the latest example of a new promotional push within the gas industry—the push towards "do it yourself electricity." While this particular building is still in the planning stage, others, such as the Park Plaza Shopping Center in Little Rock, Ark. (see picture above), are already a reality.

But the total number of such projects, whether planned or already built, is no more than a handful. As a result, it is still too early to call "do it yourself electricity" a trend.

However, top officials of the American Gas Assn exhibit considerable enthusiasm about the future prospects of self-generated electricity. This enthusiasm is directed in two directions. One is the "black box in every home" that would convert gas directly to electricity. This project is still very much in the research stage, with the gas-powered fuel cell the most talked-about method of conversion.

The second is the gas turbine installation for commercial buildings and schools. Here, the AGA can and does say that the equipment needed to do the job is available.

In addition, the AGA is trumpeting the results of a study by a Houston, Texas, engineering and architectural firm which asserts that "a 2,300-student, air-conditioned, compact school with natural gas as its only source of power can be built for about $2.3 million—about 16% less than the present conventional type of the same size without air conditioning." The study also asserts that operating costs of the new school would be about 16% less than for the same modern school using purchased power.

While the economics of the study are based on gas and electricity rates in the Houston area (27.5¢/1,000 cu ft of gas and 1.5¢/kwhr, both averages, the AGA says), the AGA is applying them on a nation-wide basis and proclaiming that a swing to the compact school design using gas turbines would save $2 billion in school taxes over the next ten years.

The results of the study appear in an attractive brochure the AGA has prepared and is now distributing to gas distributors who in turn are giving them out to school officials, architects, and engineers.

Heart of the AGA compact school concept is the gas turbine. As envisaged by AGA, the best means of reducing operating costs is several small gas turbines operating in parallel, driving high frequency generators to provide the lighting power and 60-cycle generators to provide power for motors and convenience outlets (see diagram next page).

In the diagram, air for combustion is taken in from the outside, filtered, washed to reduce dry bulb temperature and then passed through an attenuator to eliminate any inlet air noise. It then passes into the gas turbine. Waste heat from the gas turbine passes through an insulated line to the waste heat boiler where it is converted to low pressure steam. The exhaust gases then pass through an attenuator to assure further quiet operation and then are exhausted to the outside.

The low-pressure steam is passed through an absorption machine where chilled water is generated and circulated through cooling coils to remove the heat of the lighting system and human heat from the building. Early in the morning before these heat sources are available, the same steam can be used for heating the building or heating stored water.

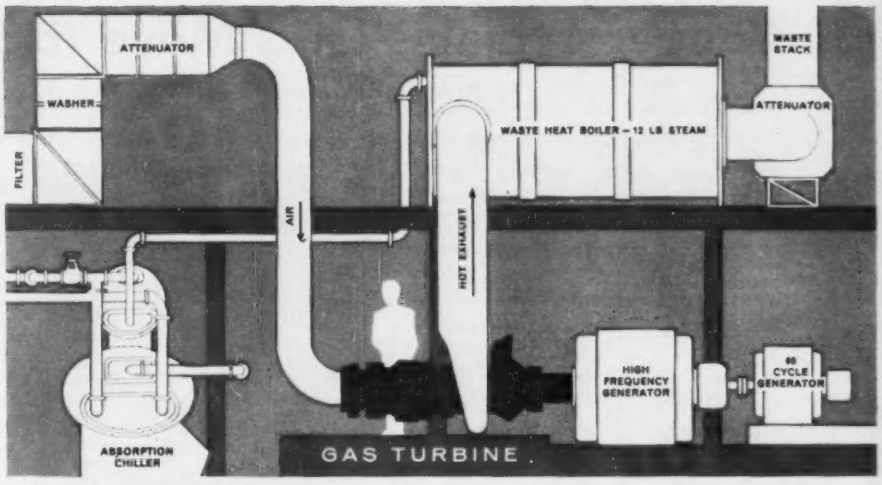
Naturally, the electric industry is not taking this school study lying down. In a detailed Edison Electric

Institute report, B. R. Askew of Georgia Power Co takes issue with many of the assumptions and conclusions in the study. For instance, Askew questions whether there is enough maintenance information available since there are such few installations in use. In addition, Askew also wonders whether noise conditions from the gas turbine will be as good as the AGA implies they will be. He also questions the statement that the system will be "in material thermal balance at all times."

In the meantime, the gas industry is stressing two installations that are already in existence, both in Little Rock. One is the previously mentioned shopping center; the other is a motel.

The installation for the $5-million shopping center was sold last fall and consists of a 1,260-hp gas turbine that drives a 900-kw generator which furnishes 3-phase, 60-cycle, 480-v power. Waste heat from the turbine is piped to a 10,000-lb waste-heat boiler which produces steam for the center's heating system and powers two 250-ton absorption-refrigeration air conditioning units.

In the 258-unit motel installation, two 12-cylinder, 450-hp motors drive 200-kw generators at alternate 700-hr intervals. All the hot water for the motel is provided from the cooling system of the engine in operation. The AGA says the motel is saving almost $1,500 a month on its fuel bill.



PROPOSED SYSTEM uses gas turbine to generate electricity in future schools

Minnesota Utilities Form Power Pool

Four new lines will link three major utilities to form a power pool which will cover most of Minnesota and the eastern half of North Dakota.

The utilities—Otter Tail Power Co, Northern States Power Co, and Minnesota Power & Light Co—will build 135 miles of 115-kv line to link their systems. This Minnesota grid will be part of a larger pool known as the Upper Mississippi Valley Power Pool (EW, Jan. 16, p 44).

The Upper Mississippi pool stretches from Duluth, Minn., to Dubuque, Ia., and from La Crosse, Wis., to Minot, N. D. This larger pool includes Interstate Power Co and Dairyland Power Cooperative in addition to the other three companies. It has a capacity of 3,100 Mw.

Construction of the Minnesota grid will be completed in 1967. The three companies estimate that the $3.1-million system will cut transmission costs by 40% compared with separate operation of the three system.

The four interconnection projects include:

- A 42-mile transmission line from Long Prairie to Brandon connecting MP&L, NSP and Otter Tail. This line will be in operation in 1962.
- A 30-mile line connecting MP&L at Royalton with NSP at St. Cloud to be completed in 1964.
- A 30-mile connection between MP&L at Verndale and Otter Tail at Henning to be completed in 1964.
- A 33-mile line connecting MP&L at Badoura with Otter Tail at Bemidji to be completed in 1967.

According to Hubbell Carpenter, MP&L vice president and chief engineer, the projects are part of long-range plans to provide for doubling of power by 1970.

This Month in Europe . . .

Cooper Explains UK's Move to Bigger Units

J. H. M. SYKES, Overseas Engineering Correspondent, London

Q: Mr. Cooper, up to the last few years you have installed units which have been rather small—60 Mw, or even down to 30 Mw—in relation to the size of your system. It seems you have decided, somewhat suddenly, to go to what might be regarded as the other extreme—500-Mw sets as standard, installed in 2,000-Mw stations. Is there some special reason for this relatively rapid change of attitude with regard to power system planning?

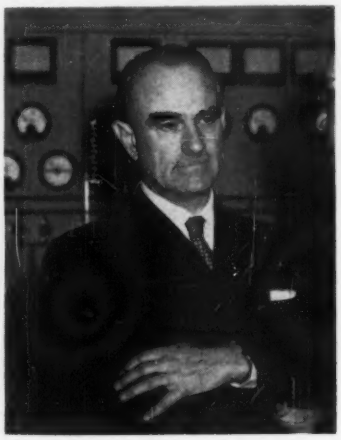
A: Well, first of all I think I should point out that there has been an evolutionary growth from the 60-Mw size. We did not jump straight to 500-Mw sets. We had 100-Mw sets, 120-Mw sets, 275-Mw sets and two 275-Mw sets in parallel to make 550-Mw sets. Then there were 350-Mw sets on a single shaft, and then 500-Mw on a single shaft, which according to our present knowledge is about as far as we can go with one unit on one shaft.

Q: But all this took place very, very rapidly in a very short space of years, when you think of the evolution from 20 Mw to 60 Mw, which was spread over perhaps 15 years.

A: Agreed, but we had two incentives to drive us forward to these higher capacity units. One was the great difficulty in obtaining suitable sites, which gave us the incentive for putting the maximum number of megawatts on one site; and having put the maximum number of megawatts on one site naturally we wished to get the highest efficiency we could in order to make the minimum calls on cooling water—and, of course, fuel supplies.

Q: Now, in relation to a system plant capacity of, say, 30,000 Mw—the position that you will be in before long—what do you regard as the largest single generating unit it would be safe to install, having regard to the fact that you might always lose one such unit?

A: Well, whenever we adopt a size for a single unit, we always assume that that single unit can come off the line by breakdown or any form of unusual incident, so that we arrange that the security of supplies will not be endangered by the loss of that set.



A. R. COOPER is one of the seven full-time members of Britain's Central Electricity Generating Board, and was appointed by the Minister of Power to take charge of all generation and bulk transmission in England and Wales. His responsibility includes about 27,000 Mw of plant coupled together by 132-kv and 275-kv lines (and soon by 400-kv lines) running to all parts of the country. This comprises one of the largest coordinated electrical networks in the world. Recently, he was interviewed by J. H. M. Sykes, *Electrical World's* Overseas Engineering Correspondent.

Q: Have you in mind some sort of particular proportion, such as 1/50th of the whole generating plant capacity concentrated in one unit?

A: The size of the largest admissible unit is governed more by the available transfer capacity than by the size of the system. Instability of the system followed by consequential tripping is a bigger hazard than a marginal drop in frequency.

Don't forget this. Until comparatively recently the general thinking about load growth in this country was that it would be difficult to hold it continuously at about 7% per annum, which is doubling at the rate of once every ten years. Our latest thinking leads us to believe that we have underestimated the rate of load growth, and that it actually might be appreciably higher than this, with the result that our plant programs, which are of the order of about 2,500 Mw a year, may have to be stepped up drastically as from the year 1966.

Increase in the plant program on this figure will place a big burden on the plant manufacturers, and particularly on the Generating Board in finding sites which can be accepted by the various authorities—the amenity authorities and the planning authorities—and the ability to supply cooling water, and so on.

All this increases the tendency to have a concentration on one site of the maximum amount of the megawatts with the minimum number of sets, so long as that is compatible with a reasonable growth in efficiency. And although it would be unwise to say that we're going to standardize on anything—because it must be remembered that at one time we decided to standardize on 60-Mw sets in order to safeguard the future—the present feelings are that while we shall undoubtedly experiment (as we are doing with two 350-Mw supercritical sets), what might be called the bread and butter requirements of the industry for some years might well be met by 500-Mw sets in stations of between 2,000 and 3,000 Mw.

Q: Yes, that brings me now to the next point. With fewer stations of larger size, you must obviously rely to a greater extent on your transmission system. I believe the new 400-kv lines will carry about 2,000 Mw on a single route, employing, of course, two circuits. If, say, an aircraft crashed into such a route, you might lose 2,000 Mw of transmission capacity, and this might represent the whole output of one of the new stations. Is this risk contemplated?

A: Yes, because in our exercises on system stability we always take the biggest single hazard we can envisage, and that would be 2,000 Mw lost on a single transmission circuit, and we have to have a

system which will accept that without instability occurring.

Q: Do you feel that there's no alternative to complete centralized control of the CEGB's system to get the best efficiency?

A: Oh, that is certainly my view, and it's based on experience and certainly not on any political prejudice. Whatever doubts I might have had about the benefits of large-scale co-ordination and centralized control were first removed during the war, when bombing knocked out some of the major stations in London, but supplies were maintained by transporting energy from as far away as Scotland, about 400 or 500 miles away, where we saved the situation by being able to co-ordinate all the resources in the country from one central point and making up deficits in one area by supplying from remote areas.

We've had other cases where strikes in certain localities have caused a shut down on stations. We've actually lost whole stations due to floods, and similar hazards. But the consumer has never felt them because of this ability to marshall from one center all the resources at your command to deal with a crisis in any part of the country, without waiting for instructions from anyone at all.

Many major hazards have occurred which would previously have meant shutdowns to local parts of the network, but these have passed completely unnoticed.

The Central Electricity Generating Board is operating 234 generating stations in parallel and if there is any limitation on the optimum performance of these stations working in harmony, in parallel, so that the best use is made of the best plant and the minimum use of the worst plant, it is only the expenditure you're willing to undertake on transmission capacity.

Q: And this is an area which you are putting right with your present work on a supergrid?

A: We have the biggest transmission program ahead of us that we've had in the history of the British grid system, and when that is in being we expect to achieve tremendous savings in operation, and of course, in reliability of supplies by working from a centralized control, and using the total resources of the country to the best advantage.

Senate Fuel Study Likely

A special Senate study of the nation's fuel and energy resources seems almost a certainty, after the Senate Interior Committee completed hearings with virtually no opposition.

Legislation to create the special study group (S. Res. 105) was sponsored by 63 Senators: 45 Democrats and 18 Republicans. It calls for a two-year study—similar to Sen Robert Kerr's (D-Okla.) recent two-year study on water resources—to be completed by January 1, 1963, with a budget of $200,000.

Included in the study would be all energy forms: coal, oil, gas, hydro-power and atomic energy.

Support for the study has come from the Kennedy Administration, Resources for the Future, Inc, labor groups, the Atomic Energy and Federal Power Commissions. Board Chairman Philip Sporn of American Electric Power Co also presented a statement at the hearing in which he "strongly urged" the study. Sporn said it is "essential that we develop a sound national fuels policy based on a full and careful study of the nation's resource base."

Sporn also predicted that electric power will supply 40% of the nation's energy requirements in the year 2000, as against 19.5% in 1960. And he added that nuclear fuel would generate about half of the nation's electric requirements in the year 2000. In contrast, Sporn predicted that nuclear energy would account for only about 2% of the nation's energy base in 1975.

Sen Jennings Randolph (D-W. Va.), who initiated the legislation, said representation on the "Senate Special Committee on a National Fuels Study" would be "geographically balanced," including all producer and consumer areas. He said the study would be "broad," and would be planned as an update of the old Paley Report (1950).

Interior Secretary Stewart Udall also praised the study. He emphasized, "We should take action now to insure against an energy gap." However, Udall called for certain conditions for the study: "We want a long-range study, a balanced study . . . (which) will use as its yardstick the enlightened long-run good of the country as a whole."

Udall called specifically for a national fuels policy to include "low-cost energy supplies," that electric systems should achieve the "most productive use and low rates to consumers through optimum utilization of present and future advances in transmission and generating technology."

A question raised by Sen Ernest Gruening (D-Alaska) as to why hydroelectric power wasn't assigned a specific, separate heading in Randolph's proposed draft of study headings produced assurances from Randolph that: **(1)** Hydroelectric power would be assigned a separate heading, or **(2)** Hydroelectric power would be studied as fully as other energy sources, regardless of how it is fitted into the final report.

NIPSCo Offers to Buy City System

Northern Indiana Public Service Co is negotiating with the Goshen (Ind.) city council for the purchase of the municipal electric system for $2 million. Under terms of the offer, NIPSCo would allow the city to retain all buildings and real estate and to keep the present 9.3-Mw diesel plant for salvage disposal. Land and access easements would be granted to NIPSCo for a substation to connect the city with the company's transmission system.

Jobs would be provided with NIPSCo for all employees of the municipal electric system, offering them all fringe benefits now available to company employees. No rate increases are planned as a result of the sale. Rather, customers will be able to choose between the city rate schedule now in effect or the company's standard rate schedule, giving some customers a lower rate at present. Sales of the municipal facilities would raise the company's total tax contribution from $90,000 to over $138,000 and would eliminate duplication of facilities in the city.

615-Ft Towers Lift 275/400-Kv

West Thurrock Crossing will close up Supergrid in south England, 275-kv London Ring; aid in uprating to 400 kv

Two 615-ft steel towers at a new River Thames crossing will support special 275/400-kv twin-conductor circuits for closing the 275-kv Supergrid in southern England. This West Thurrock Crossing will extend the Supergrid into southeastern England and seal the 275-kv ring around London.

The crossing is being built as part of a new line which starts at the Central Electricity Generating Board's 275-kv station at West Thurrock on the Thames's north bank. Its special conductors will carry the new line to Northfleet. From there, the 275-kv line will proceed through Canterbury to Lydd, where it will connect to the cross-channel cable and the nuclear power station under construction at Dungeness.

To Be Part of 400-Kv Grid

This crossing is a major stage in the CEGB's plan to uprate the Supergrid from 275 to 400 kv. The plan has two purposes: To increase the Supergrid's transmission capacities; and, to minimize the number of grid lines that are required.

The crossing between West Thurrock and Northfleet appeared to be the most suitable for the two 615-ft towers together with two anchor towers for taking the conductors' strain. CEGB transmission design engineers decided on it early in their design studies. At West Thurrock and Northfleet, the conductors could be supported at a height which would allow the lowest point in the 4,500-ft span to clear the river by at least 250 ft at mean high water.

The twin 0.4-sq-in. steel-cored aluminum conductors for each phase in the 275-kv Supergrid were not strong enough to constitute a 4,500-ft span. Yet experience with them enable CEGB to develop a 199-strand, steel-core conductor, consisting of 91 to 120 tons per sq in. grade steel wire as a core with a cover of three layers of 108 strands of aluminum.

This conductor's capacity matches that of the twin conductors of the incoming lines, and its 2.262-in. diameter accommodates the maximum operating pressure of 400 kv without corona losses. Its mechanical strength, allowing for an economic sag, is calculated as an ultimate 290,000 lb; and, its modulus of elasticity, 14.25 x 10^6 psi. Its maximum working tension is given as 97,200 lb.

In working out the cable's design, the CEGB took into account the aerodynamic effects expectable on a long span as well as the usual meteorological probabilities. As designed, the radial thickness for an ice loading is 0.5 in. and the wind load on 80% of wind span 15 psi. The design calls for a midpoint surmounted ground wire of the same construction as the conductors. The latter wire will give a shielding angle of 45 deg. This use of a conductor for shielding affords uniform mechanical characteristics and economic life, in addition to the obvious interchangeability.

The 615-ft towers are square in plan and have a 100-ft square base. Over-all length of the top crossarm is 74 ft. Each tower has 21 main leg sections, 25 to 31 ft long, forming 11 panels. The lowest five panels are modified K-bracings and those above are a series of open diamond and scissor-braced panels.

The tower is shaped gracefully by the change in leg slope at every second panel, every 125 ft, these intervals allowing the convenient placement of aircraft-obstruction lights at main horizontal bracing members which support the access catwalks. The main "half-way house" maintenance platform is at the top of the third pair of panels, 375 ft, and will carry an overhead track and trolley along with winching equipment for lifting the assembling spare insulators. Other maintenance lifting gear is at the top of the tower, which is supported by a special crossarm above the topmost conductor crossarm. The three conductor crossarms are spaced at 31-ft 3-in. intervals.

A 15-ft square central column has been carried up as far as the 375-ft maintenance platform. This column, during the erection of the six lower panels, afforded a base for the derrick and gave a structure around which a central stairway could be built of standardized units. It has catwalks radiating out to the aircraft lighting panels. The catwalks function also as central lifting wells for maintenance materials and equipment.

The steelwork is standard, galvanized, high-tensile steel rolled sections and was fully assembled on the site. Anchor towers are also high-tensile steel and are in four panels, 30, 41, 41, and 33 ft high. Each panel forms an open diamond. Each anchor tower has three pairs of auxiliary crossarms for supporting jumpers between incoming lines and crossing conductors.

Insulators Hung From Universal Bearings

Mounted at the end of the suspension tower crossarms are universal bearings from which insulator assemblies are hung. These assemblies will later have jacking equipment for allowing removal of the insulator strings for servicing. Suspension assemblies on the crossing towers consist of six insulator strings in parallel. The tension sets have eight parallel strings. All insulator assemblies have lever balancing between strings and are designed for equal load sharing in the event that one string fails.

Each string has 20 porcelain units in both the suspension and tension sets, two additional units being fitted to each tension set to improve the wet flashover values because of the bunching of eight strings in an assembly. Diameters and centers are 14 x 6¾ in. in suspension sets, 12¾ x 7½ in. in the tension sets, over-all lengths being 275½ and 294¾ in., respectively. Ball-

Conductor Over River Thames

and-socket insulator couplings are used throughout. Ultimate load for suspension sets is 180,000 lb; for tension sets, 240,000 lb.

Foundation work started early in 1959 on both sides of the river, and tower construction began in August 1959. Crossing tower foundations are 30 reinforced concrete piles, each 17 in. square, at each of the four tower legs. At the anchor towers, there are 100 piles at the rear to resist overturning forces. Piles were driven 40 ft deep on the north side, and 45 ft deep on the south bank. All four towers are aligned to within ¼ in. over a total length of 7,700 ft.

Spans Checked by Theodolite

The spans were first checked with a geodetic theodolite, and a telurometer was used for the final check to within 3 in. over the 4,500-ft span distance. Alignment accuracy was obtained by mounting neon tubes vertically on masts at each site and aligning these by nighttime theodolite observation under the control of VHF radio.

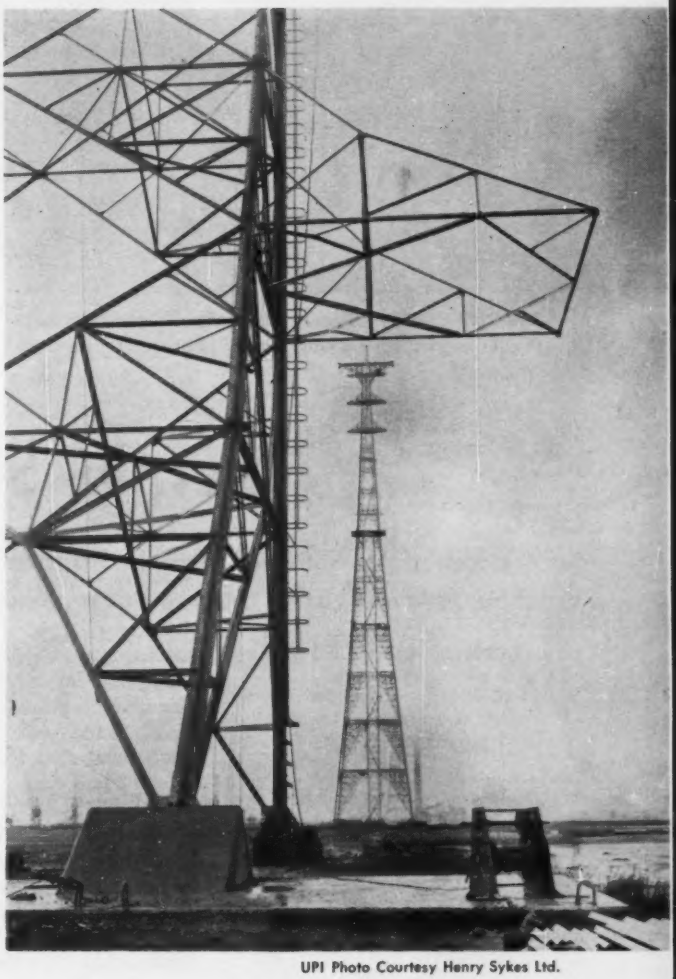
Building began at each crossing tower with the erection of the first 125 ft of the central column. Upon this column an 80-ft derrick was mounted in a lifting rig for the erection of the first 60-ft panel. The central column was then extended another 60 ft, the luffing derrick was lifted to that level, and erection was continued on the second panel of the main structure. Above 350 ft, the derrick was used as a floating rig for the main construction.

The most intricate section of the crossing towers' construction was the top maintenance crossarm, whose erection required an additional derrick at the 600-ft level. This crossarm was put together, section by section, 615 ft above the ground, the early sections being stayed. This done, the six lower insulator crossarms were raised into place. These, each weighing 2½ tons, had been pre-assembled on the ground.

When the time comes, a special procedure will be used for stringing the conductors. Two ropes will be laid in the river, their ends passing over the tops of the towers. Stringing will be confined to times when river traffic can be halted. The ropes will then be hoisted out of the water and tensioned by winches and tackle at the rear of the anchor towers.

In this procedure, one rope will be the track for a set of trolleys; the other the means of hauling. Through the trolleys, the ropes will be "stitched" into a system for carrying the conductor which will be in another set of suspension trolleys. The latter set will make the actual passage over the river. These suspension trolleys will be fed onto the system at one end, and the stitching trolleys will be removed at the other. The conductor drum will be on the north shore; the pulling winch on the south.

As the conductor is received at the far anchor tower, it will be tensioned at both ends and released from the suspension trolleys.

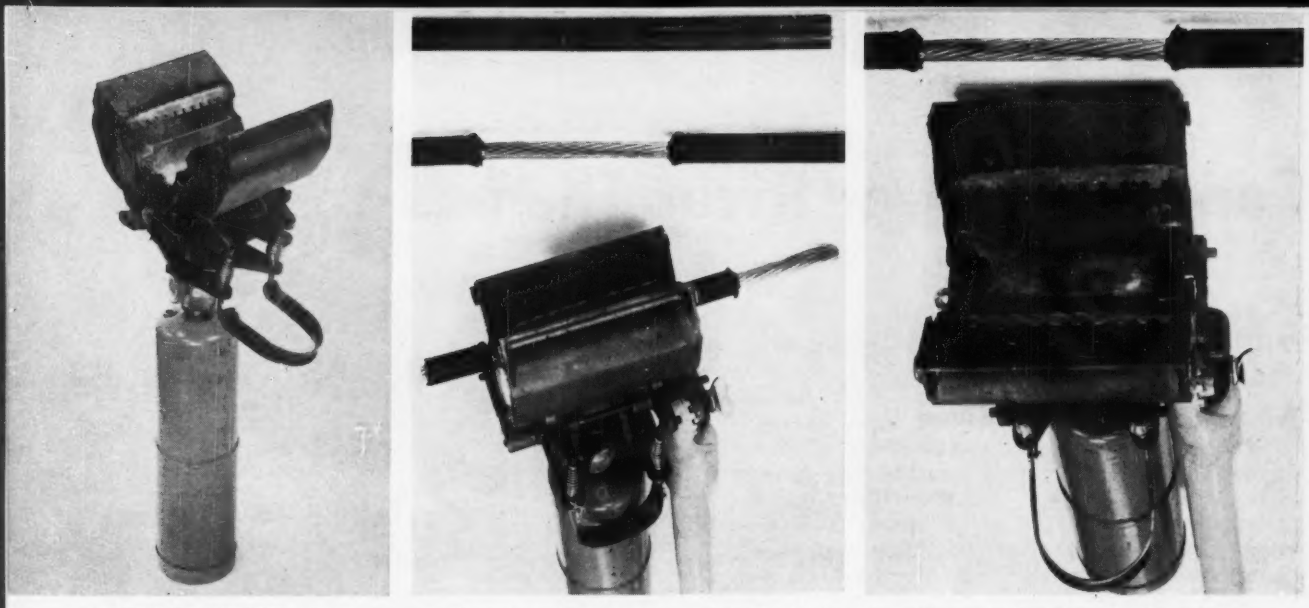


UPI Photo Courtesy Henry Sykes Ltd.

THAMES CROSSING tower at West Thurrock has three conductor crossarms, maintenance platform. Special tower-top crossarm supports more lifting gear

This method will be practicable because the sag of the rope will exceed that of the conductor in its service position. Tension and suspension insulators will be inserted at the anchor and crossing towers before the track rope and trolleys are prepared for the next conductor. The hauling rope will then be reversed, the stitching trolleys re-attached, and the suspension trolleys will then be recovered at the north bank anchor tower.

Stringing operations will be directed by VHF radio, as many as six sets maintaining contact among teams on the ground, on the tower top, and on the opposite side of the river. At no time may a conductor touch water or ground—a precaution to prevent damage to the cables which could result in corona losses.



THERMAL SKINNER closes over conductor and removes tough covering by combined action of heat, cutting blades, and toothed edge. It performs in less than 2 min and is applicable with hot stick; leaves wire undamaged

Thermal Skinner Spurs Use of

Tool adapted to hot stick, modified spacers, messenger brackets promote LILCO higher-voltage spacer-cable lines

D. W. LANGELLA, Distribution Engineering Department,
W. J. CONCHILEK, Overhead Lines & Service Department, Long Island Lighting Co, Hicksville, N. Y.

A new tool enables Long Island Lighting Co to remove polyvinyl chloride (PVC), linear polyethylene, and other common wire coverings, thus affording incentive for greater use of covered wire on the company's overhead primary distribution systems.

Older Methods Too Slow

Past methods of removing tough "tree-wire" insulation were slow and tedious. Generally, they were applicable only to conductors not requiring hot-stick handling. The new device cleanly removes a segment of insulation in less than 2 min, preparing the bare conductor surface for deadends, splices, junctions, sectionalizing, and supply-lead connections to transformers, capacitors, and other distribution equipment.

What is especially notable is that this device is adaptable equally to non-energized and energized circuits, the latter including those at voltages necessitating hot-stick methods. Its development involved the collaboration of LILCO, Ellis Engineers & Associates, and Connecticut Special Machine, Inc.

Has Blades, Toothed Edge

The tool has a thermal chamber, comprised of two hinged and spring-actuated halves for encompassing the conductor. Within the chamber are circumferential and longitudinal blades and a toothed edge for cutting through insulation and pulling it free from the conductor.

The chamber's base has orifices and a flame barrier to insure uniform heat and protection against wind and is designed for attachment to a small commercial propane tank. The chamber also contains a device for attachment to the universal head of a hot stick, so that tool-and-torch assembly can be safely applied to and removed from an energized conductor by approved hot-line techniques.

Attack Is Threefold

The insulation is removed through the combined functions of heat from the torch, the spring-actuated cutting edges, and the downward pull of the hot stick upon removal of the assembly at the end of the heating period. Three interchangeable cutting edges cover LILCO's complete range of distribution conductor sizes, No. 3 AWG copper through 336.4 MCM aluminum.

The assembled skinner weighs about 8 lb and can be carried in a commercialy available tool box.

LILCO has used the tool successfully on copper, EC Grade aluminum, and aluminum alloy conductors. The brief heat application and cutting edge action have no significant effect on conductor characteristics, the conductor surfaces requiring no after cleaning before connections are made. The tool has performed satisfactorily in experimental and field conditions, removing both 10/64-in. PVC and 8/64-in. linear polyethylene.

Speeds Spacer Cable

The need for such an efficient tool became acute when LILCO decided to expand its use of insulated conductors for overhead primary circuits, so that they might better withstand normal tree contacts, accidents, and storms. The successful solution of hot-stick skinning problems accelerated the company's

SPACER attached to the messenger by a hot-line clamp eases spacer replacement without de-energizing line

TOOL can be manipulated easily by hand or hot stick in skinning wire for deadends, splices, other connections

Covered Distribution Primaries

consideration of spacer cable for 15-kv operation. One installation has been made, constructed to 15-kv standards but operating initially at 4 kv.

Of interest in connection with its initial installation, a test line was constructed in LILCO's linemen's training area at Hicksville, and the various procedures for hot-stick construction and maintenance were tried out. Most ordinary construction, such as installation of transformers and other line equipment, it was found, could be accomplished readily on energized 13-kv circuits, where "sticking out" was practicable.

PVC Ties Replace Copper

The latter involved the adaption of one-piece porcelain spacers with conductor grooves and provision for tying conductors to the spacer. This eliminated disassembling complicated two-piece spacers and unscrewing bolted spacers with hot sticks.

Furthermore, preformed PVC ties were used in place of copper, providing greater ease of installation as well as re-use as compared with the copper.

A hot-line clamp for attaching spacers to the messenger, used instead of the clamps normally furnished, was found to facilitate replacement of the spacers without de-energizing the lines. Another modification of the spacers was the addition of a bronze rod between the spacer and the spacer clamp, which provided a 6-in. clearance between messenger and spacer head and adequate clearance when the conductors were linked out.

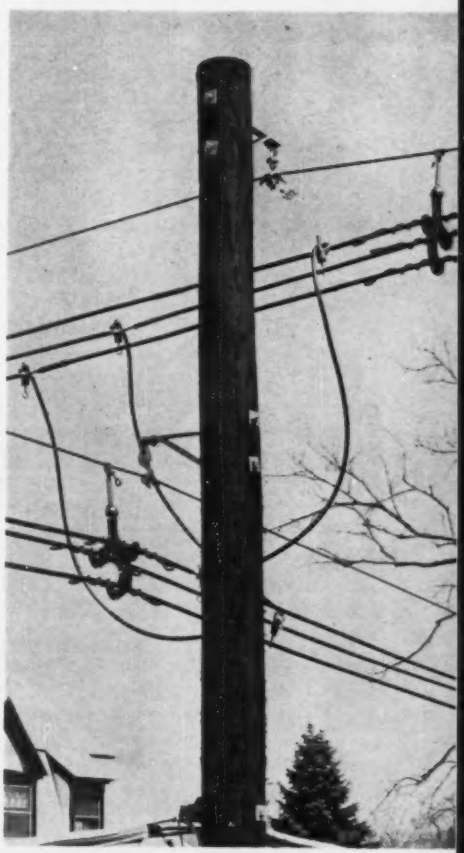
Brackets Modified

The messenger mounting brackets were adapted so that an angle clamp could be substituted for the clevis and three-bolt clamp, as furnished. This modification gives an integrated messenger, spacer, and conductor assembly suspended from the bracket, rather than a messenger separately installed on a messenger clamp.

60% of Load at 13 Kv

This new arrangement permits the entire spacer-cable assembly to be hot-sticked out from the pole when pole equipment is being installed. It also makes pole replacement possible.

The modifications and the thermal skinner facilitate hot-stick operation of spacer cable, a necessary procedure in LILCO territory, where some 60% of the system load is distributed at 13 kv.



PREFORMED PVC TIES replace copper ties, facilitating installations

Raise Voltage Flicker Limits 20-60%

RAYMOND SHUPTAR, Electric & General Engineering Dept, Consumers Power Co, Jackson, Mich.

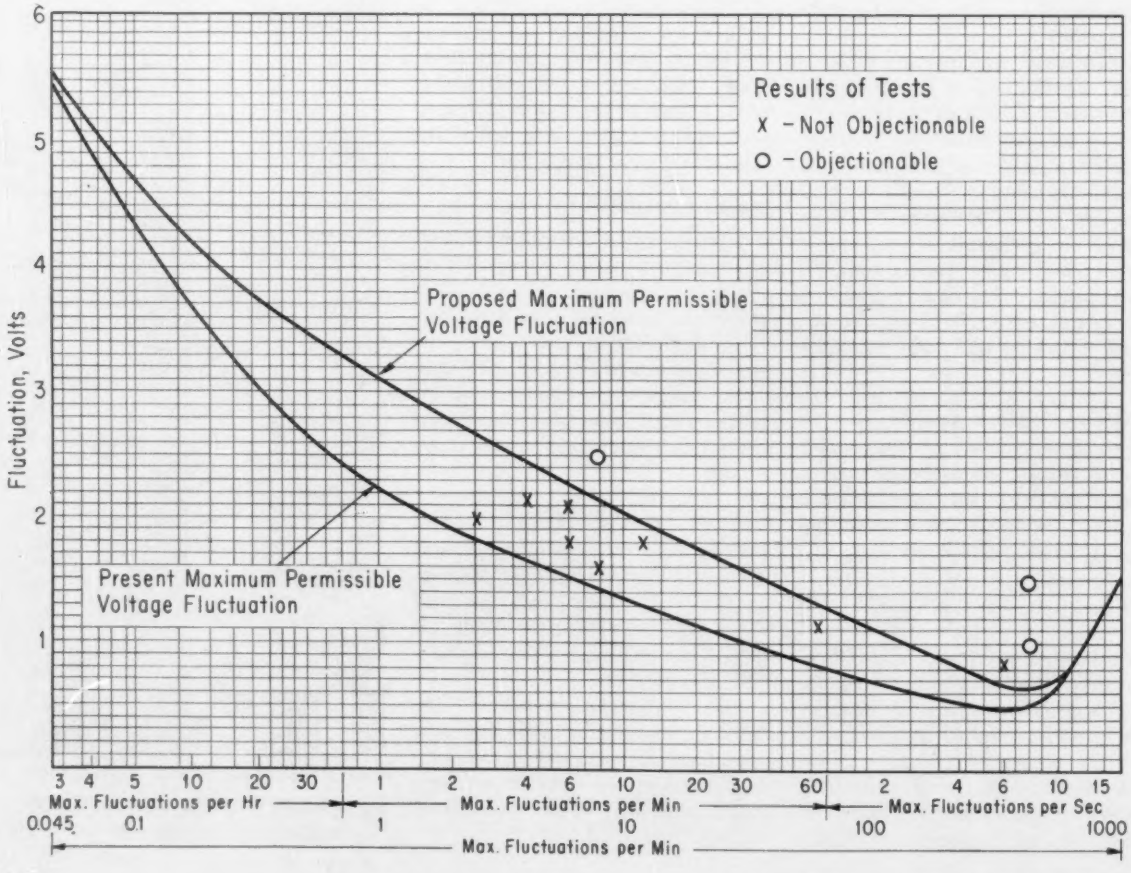
Maximum permissible voltage fluctuation, or flicker, on distribution lines may be increased from 20% to 60% over the previous "standard" curve depending upon the number of fluctuations per unit time. This is the conclusion of Consumers Power Co after an investigation at 11 different locations where either welder or reciprocating compressor loads were supplied. The average distribution substation serving these loads is 5,000 kva capacity; the average size conductor, No. 2 ACSR. The majority of other customers served by these substations are residential.

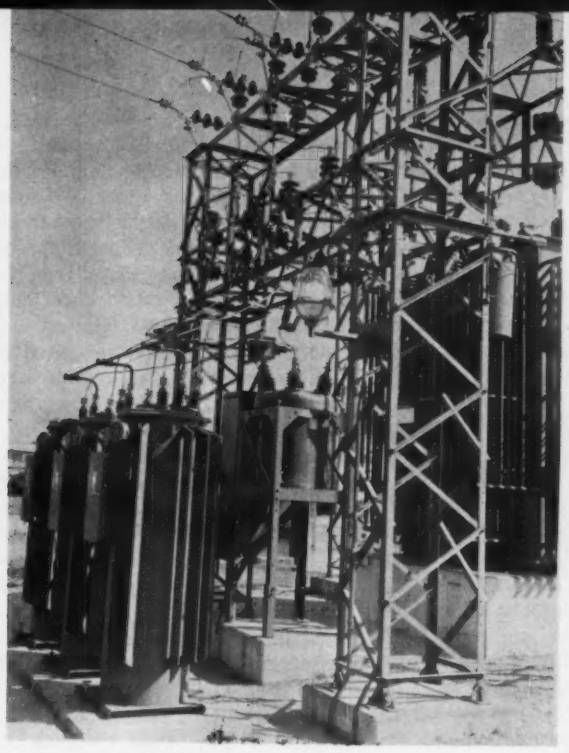
Consumers Power has been using a flicker curve similar to the one included in the AIEE publication, "Power Supply to Resistance Welders," to determine whether a fluctuating load would cause objectionable voltage flicker. But it was felt this curve was unduly conservative.

To verify this opinion, an investigation was made to find those customers with loads that exceeded present limitations but still did not cause objectionable flicker complaints. From records of preliminary calculations, those loads indicating potential flicker problems were chosen as test points. With each customer cooperating, oscillograph records were made of voltage drop, instantaneous demand and frequency of operation. If a load connected for a period of time did not generate complaints, then the flicker was considered not objectionable.

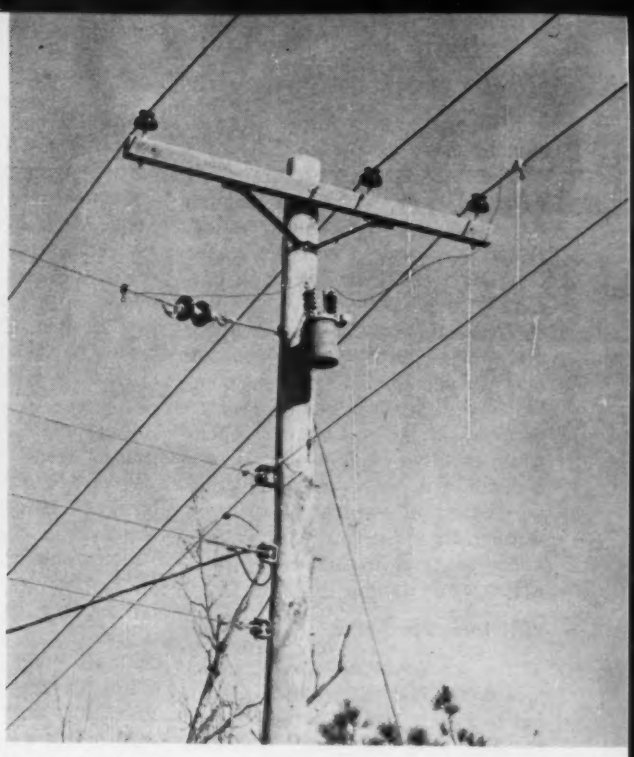
To date, tests were made at 11 different locations, representing nine welder loads and two reciprocating compressors. Eight of the locations indicated the voltage flicker was above our standard, but not objectionable, while three were above and objectionable. Two of these were temporarily corrected by rerouting primary lines to isolate flicker from customers. The permanent solution, the addition of flywheel effect to the motor-compressors, is being achieved by the customers. In the third case, the customer was requested to change his operation to a rate at which the flicker would not be objectionable.

From data developed in the 11 tests, a new curve was drawn as illustrated. Consumers Power will accumulate further test data and field experience on various types of fluctuating loads. The new curve will be reviewed periodically to see if modifications are warranted.





OIL CIRCUIT BREAKERS in substation are co-ordinated with sectionalizers on feeders for protection



SECTIONALIZER on feeder operates when distribution circuit is de-energized, avoiding heavy-duty requirements

Sectionalizers Improve Protection

Teamed with substation OCB's, they cover 85% of distribution circuit at cost of guarding 52% with reclosers

HARRY T. MORGAN, Engineer, Electric Power Board of Chattanooga, Chattanooga, Tenn.

Need for a better and more economical sectionalizing system for 12.5-kv distribution circuits prompted Electric Power Board of Chattanooga to develop a protective system combining oil circuit breakers in the substation with automatic oil circuit sectionalizers on feeders.

Developments behind the change from protection with breakers and reclosers included the growth almost overnight of many rural areas into residential suburbs where about 95% of the customers were all-electric. New substations at new load centers had short main feeders and heavily loaded laterals. Only heavy-duty reclosers could interrupt the higher fault currents on close-in taps.

The cost of the heavy-duty recloser being high, only taps subject to the greatest hazards were provided with automatic sectionalizing. On some taps, the proper size recloser, which requires 200% of rated load to trip, could not protect against minimum ground fault. Although more single-phase reclosers would have given better sectionalizing, it was not economical.

Sectionalizer Is New

OCB and oil circuit recloser characteristics are well known. The sectionalizer, however, is a new device, and an understanding of its characteristics is essential to its coordination with other equipment for high-quality, economical distribution system protection. Key to the combination's economics and performance is the operation of the sectionalizer after the OCB has deenergized the circuit. This eliminates the heavy-duty requirements of fault interruption at the sectionalizer and simplifies coordination.

The sectionalizer on the Chattanooga system is basically an oil switch for sensing a fault by means of current flowing through its coil. It contains a simple hydraulic counting mechanism actuated by the coil. Excessive current draws a plunger into the solenoid, simultaneously compressing a spring and forcing oil into the space between the plunger and the trip piston.

When current is interrupted by the substation circuit breaker, the magnetic force of the coil disappears and the spring restores the plunger to its original position, forcing oil trapped behind it into the trip cylinder. After a pre-set number of operations, the trip piston strikes the trip lever to release a toggle, and the sectionalizer's contacts are opened by a loaded spring.

Both counting and trip-out operations are completed after fault current has been interrupted temporarily by the substation circuit breaker. A mechanical adjustment sets the sectionalizer to open after one, two, or three operations of the substation circuit breaker or other protective device in the cir-

cuit on the source side of the sectionalizer.

The sectionalizer takes only 1 cycle of fault current to position the solenoid plunger for counting. About 5 cycles completes the counting operation while fault current is interrupted.

Trip-out is completed in about 10 cycles. Such values indicate that the sectionalizer can be combined with practically any modern breaker. As the sectionalizer opens while the line is de-energized, coordination is no problem. A gradual settling of the trip piston back through the oil permits the sectionalizer to reset automatically after a temporary fault.

Will Interrupt Loads

The sectionalizer was not designed to interrupt fault current, but to isolate faulted sections while the line is de-energized. But load currents up to 220% of coil rating may be interrupted by its manual operation. Lightning and transient surge protection may be provided by a simple external gap or a standard lightning arrester. Cost of the sectionalizer is about 20% of that of a heavy-duty recloser.

Factors affecting the application of sectionalizers remain the same, whether they are combined with circuit breakers or reclosers. General conditions which must be satisfied are:

1. The breaker or recloser must sense and interrupt minimum fault current at the end of the sectionalizer's protective zone.

2. The sectionalizer's short-time current rating, 1 sec withstand, for the total clearing time of a fault, must not be exceeded.

3. Reclosing cycle of the breaker or recloser must be so fast that the sectionalizer does not lose count.

4. The total load unbalance, created by sectionalizing the most heavily loaded tap, must be less than the ground relay pick-up current to prevent false tripping of the station OCB.

Phase-to-ground faults are limited mainly by the resistance of the ground itself. Accepting an average value of 40 ohms for ground resistance in suburban areas, the ground impedance alone limits phase-to-ground fault currents on a 12.5-kv circuit to 180 amp. Including conductor impedance, currents for these faults should generally exceed 160 amp, which will actuate sectionalizers with continuous-current ratings through 100 amp. Ground relays being set for 160 amp, coordination is achieved when the sectionalizer is set for one less operation than the breaker. For best results the sectionalizer should be set to lock out after three operations and the breaker, after four.

Line taps with phase-to-ground fault currents less than 160 amp will not be fully protected by the basic OCB-sectionalizer plan. On these lines heavy-duty reclosers, which would be limited to ratings of 70 amp by low fault currents, may be installed. But, for complete coordination of load, minimum fault currents, and continuous current rating of the recloser, it may be necessary to move the recloser farther out on the line than is desirable.

The required minimum phase-to-ground fault protection may also be provided by installing a light-duty recloser on the load side of a sectionalizer, where the ground fault current is slightly more than 160 amp to provide an overlapping protection with the ground relay. Greater fault currents in the recloser's protective zone create difficulty with coordination, because the sectionalizer senses these currents and completes a counting operation with each interruption of the fault current by the recloser.

Modify Recloser

Unless the recloser is modified to lock out after two operations, the sectionalizer will open and interrupt the load current between it and the recloser. The opening of the sectionalizer will give a false indication of fault location. The recloser must isolate faults in its protective zone.

Modification of the recloser for this application consists of inserting discs in the hydraulic mechanism to displace the trip piston a distance equivalent to two operations. As the fault is cleared after the recloser's second operation, the sectionalizer will reset.

Cost of the sectionalizer and light-duty recloser is $252, or about 60% of that of a heavy-duty recloser. This plan also provides two sectionalizing points instead of one on the tap.

The OCB-sectionalizer plan has a distinct advantage over alternates using reclosers or fuses. Without having to coordinate with other interrupting devices, instantaneous elements of phase relays may be set to pick up for much lower currents. More sensitive relaying and faster interrupting reduce possible system damage by fault currents.

Can Lose Count

Design of the sectionalizer's hydraulic counting mechanism provides for a gradual settling of the trip piston or armature through the oil to its normal position, permitting automatic resetting after a temporary fault. This feature may cause the sectionalizer to lose count during an extended reclosing interval of the OCB. Some sectionalizers may lose count in less than 15 sec.

A satisfactory reclosing cycle, which may be used with the OCB-sectionalizer plan, is one instantaneous, one 10-sec, and one 60-sec-delay reclosure. For a persistent fault, a sectionalizer set for three operations would lock out during the 60-sec delay. Since the sectionalizer is set to operate after two breaker reclosures, however, the time delay of the third reclosure has no bearing on the sectionalizer's operation. The third reclosure delay should be kept short to reduce the outage time of customers not on the faulted section.

The breaker must be de-rated by a factor of about 85% for this reclosing cycle. If the time delay of the third reclosure is cut to 15 sec, it is not necessary further to de-rate the breaker.

One problem of any sectionalizing plan is maintenance of proper load balance to prevent breaker tripping by the ground relay. Assuming 100 amp maximum load for any branch line, normal feeder unbalance should be limited to 50 amp for a ground relay setting of 160 amp. But greater off-peak unbalance could be tolerated.

In high-load-density areas, where there are both electric heating and non-heating customers, load balance by connected kva of distribution transformers is not adequate. An alternative plan must consider the load components, heating and normal use. Satisfactory balance is

maintained throughout the year when heating and normal use loads are distributed per phase.

Since the OCB-sectionalizer plan was adopted by the Electric Power Board of Chattanooga late in 1958, some 200 sectionalizers have been applied in substation areas having a total capacity exceeding 100,000 kva. Reclosers replaced by sectionalizers have been moved to rural areas to give over-all improvement in distribution performance.

In any sectionalizing plant, standardization conserves application time. The 100-amp sectionalizer proved most suitable for the Chattanooga system. Its continuous current rating is enough for most branch-circuit loads. Minimum fault current is generally higher than the 160 amp for actuating its solenoid coil. The 100-amp sectionalizer's 1-sec rating is adequate for a maximum fault of about 4,000 amp, which can be interrupted in nine cycles.

Plan Is New

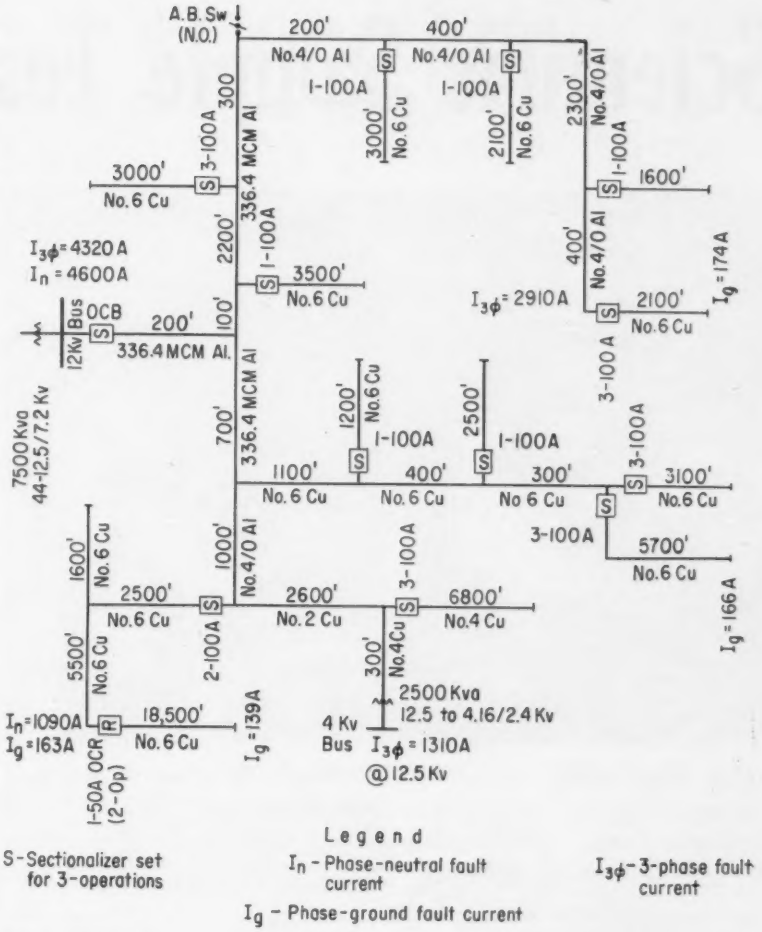
While the new sectionalizing plan has not been in use long enough to supply much operating data, performance has been satisfactory. Evaluation of the plan in an actual substation area will perhaps give a better picture of the economics.

In one area a 7,500 kva, 44/12.5-kv substation has one 336.4-MCM aluminum feeder. There is a load division immediately outside. Each section has an air break switch for manual sectionalizing. Maximum short-circuit duty on the station breaker is 4,600 amp. Except for one long tap, the minimum phase-to-ground fault current is 166 amp. Installed were 23 100-amp sectionalizers and one 50-amp light-duty recloser. The recloser is on the load side of a sectionalizer to provide necessary ground-fault protection, 139 amp.

Cost of the sectionalizing devices was $2,176. Reclosers would have cost $9,660. Actually, cost of the applied devices was equivalent to the cost of only five heavy-duty, single-phase reclosers, or less than the cost of one 3-phase recloser with ground-trip attachment.

Some evaluation of customer interruptions may be in order. Temporary faults are cleared in a maximum 12 sec. Normal service is restored in a maximum 72 sec, which can be reduced to 27 sec, for each persistent fault beyond a sectionalizer. As there are no critical loads in residential areas, such outages are insignificant.

Perhaps a better economic analysis would compare the performance of sectionalizers and reclosers representing equal investments. In one area, 85% of the total substation exposure is protected by 23 sectionalizers, only 15% being unprotected. Five heavy-duty reclosers could protect 52% of the exposure, leaving 48% without automatic sectionalizing. Then, for every 100 permanent faults, 15 station lockouts may be expected with the OCB-sectionalizer plan compared to 48 for the recloser plan of equivalent cost. This yields a probability ratio of 3.2:1.



SCHEMATIC shows sectionalizers and OCB's in combination that protects 85% of distribution circuit at cost of protecting 52% with heavy-duty reclosers

Similar results are obtained by comparing interruptions for persistent faults in the protected zone of each sectionalizing device. The sectionalizer will interrupt an average of 3.7%; the recloser an average of 10.4%. This gives a customer interruption ratio of 2.8:1. But temporary outages to 96.3% of the customers with the OCB-sectionalizer plan would reduce this ratio.

The sectionalizer, teamed with the relay-controlled OCB, is a practical, economical means of isolating persistent faults on branch lines in high density areas. More sectionalizers than reclosers can be installed for the same money. With more taps protected, the probability of prolonged outages for an entire substation area is reduced with sectionalizers.

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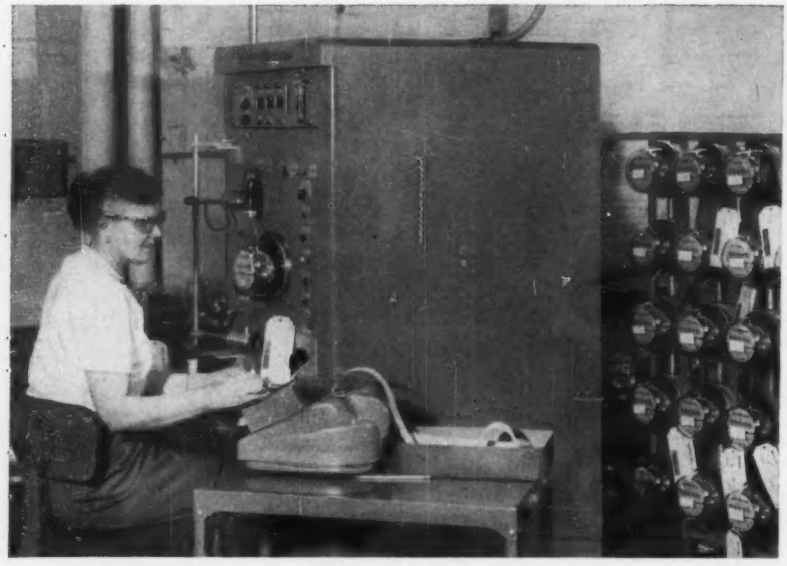
Scientific Sample Testing Saves



NEW ELECTRONIC EQUIPMENT SPEEDS TESTING of watthour meters. Using G-E's all-new transistorized Electronic Test Units (ETU)* almost any utility, large or small, can gain the many benefits offered by advanced electronic testing . . . greater accuracy, reduced testing costs, automatic data collection.

*Trademark of General Electric Company.

UTILITY ACCEPTANCE GROWS

Utility regulatory commission acceptance of meter statistical sample testing is increasing. Today, just three years after the breakthrough by a southern utility, more than 21 electric utilities are using sample testing techniques in some form; and 17 regulatory commissions have approved the use of sample testing techniques in their states. In addition, at least 14 others are known to be studying sample testing or are planning to propose it to their commissions. With increasingly large numbers of meters being added to utility systems each year, the number of meters to be tested is rising sharply . . . and testing costs are increasing. It has been proved that statistical sample testing can perform this testing operation with a tremendous saving in time, money and material.

Utilities, G.E. Cooperate to Advance Practice of Meter Sample Testing

General Electric, with long experience in statistical sample testing in meter manufacturing, is working closely with electric utilities to promote better understanding of this practice throughout the industry.

As a pioneer in statistical sample testing of meters—over 10 years, experience in the application of sampling techniques to meter manufacture—General Electric is cooperating with electric utilities to facilitate wider acceptance of this economical and efficient meter testing method.

For example, sample testing seminars—cooperative informational programs conducted by General Electric for over three years—make available to utility metering personnel a wealth of information on sample testing and proved statistical techniques gained from years of practical application of sampling to meter manufacture.

In addition, through the publication of articles, informational bulletins and other data, General Electric has contributed its knowledge of sample testing and sampling techniques to the electric utility industry.

As a leader in meter design and manufacture, it is General Electric's goal as a major supplier to provide electric utilities with the products necessary to make sample testing feasible—highly reliable, advanced-design meters that are certified for uniform accuracy and performance. With over 12,000,000 magnetic suspension meters in service without a reported bearing failure, this goal is now a proved reality.

In General Electric's meter laboratories at Somersworth, N. H., research is progressing on the meter of the future. Here, design innovations, new materials and manufacturing processes are under constant study and evaluation to provide utilities with the greatest possible value for their meter dollar.

(Advertisement)

Two Utilities $1,000,000

CERTIFICATION: Key to Statistical Sample Testing

Meter accuracy and performance are prerequisites for statistical sample testing. For more than 10 years, General Electric single-phase magnetic-suspension meters have been certified for accuracy and performance. Average accuracy is within 0.1% of reference kilowatt hour (average accuracy of each meter is within ±0.45% of this average); and G-E meters are certified 99.9% free of defects which might cause improper registration or operation. This is reliability, proved by over 12,000,000 G-E magnetic-suspension meters in service without a single bearing failure.

Annual Savings of $600,000 and $400,000 Estimated by Utilities After First Year's Operation of Meter Statistical Sample Testing

SOMERSWORTH, N. H.—Greatly reduced testing costs resulting from meter sample testing were dramatically highlighted recently as two large electric utilities estimated their first year's savings. The results: a combined savings of over $1,000,000 as testing costs were reduced over $600,000 in one case, and $400,000 in the other.

Sample testing is basically the use of statistical methods to analyze and evaluate a group of similar meters from a properly selected sample.

Elimination of mass testing means that utilities can put their testing dollars to the best possible use—necessary testing is directed to groups of meters where it will do the most good. For example, modern meters are sample tested only to verify their continued performance, while older meters are given the amount of testing necessary to insure their accuracy is up to required performance standards.

In addition, the savings made possible by use of sample, rather than mass testing, can be used to mass-test existing older meters and to upgrade the entire utility metering system by replacing old, substandard meters.

This proved performance of statistical sample testing—which has also been used successfully in mass-production industries, government agencies and the U.S. Military Services—could provide the necessary impetus to accelerate its widespread acceptance by the entire electric utility industry.

The findings of the two utilities also point out another important aspect of statistical sampling. There is no "one best method" to sample test meters; there are many, depending upon the information desired. Each sampling plan must be designed to meet the needs of the individual utility.

Statistical sample testing is now gaining wider acceptance. As additional experience is gained in its use and application, continued advances will be made—advances that could mean even greater savings for the electric utility industry . . . a possible $70,000,000 annual savings in meter testing costs in just 10 years through the universal use of scientific meter sample testing.

Sampling's Goal: OPERATING COST BREAKTHROUGH IN METERING

Properly applied to watthour meters, statistical sample testing is a tool which can help the electric utility industry achieve a primary goal: more accurate metering at less cost. The use of established sampling techniques in the testing of meters—rather than 100% initial and periodic testing—enables meter maintenance operations to be programmed and concentrated on those types or groups of meters which are found to perform outside acceptable limits. Thus, unnecessary testing—and unnecessary testing costs—of many thousands of accurate meters is eliminated. These savings resulting from sample testing can be applied to retiring and replacing old, inaccurate meters and mass-testing older meters that require such accuracy check—to raise the performance level of the entire system. And, the data gathered through the use of sample testing plans will provide more explicit and accurate information about meter performance, giving meter engineers the facts necessary to provide for the most efficient operation of their metering plant.

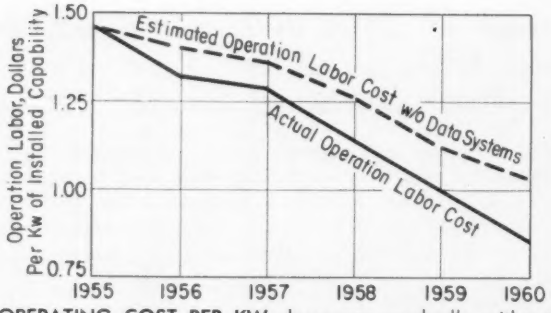
713-06

METER DEPARTMENT

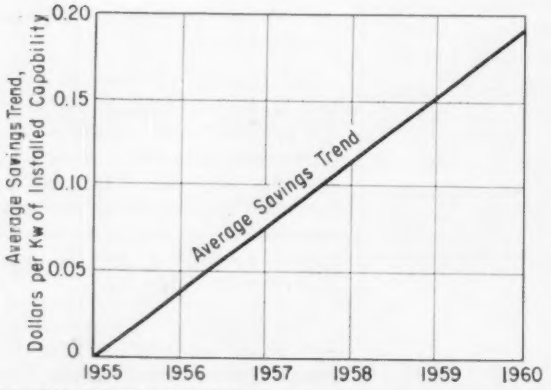
GENERAL ELECTRIC

Automatic Data Systems Cut Costs

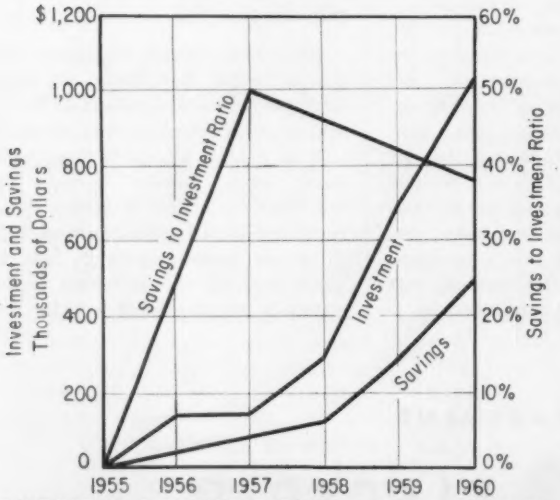
ISA symposium told Gulf States Utilities' five-year economies amount to $357,000



OPERATING COST PER KW decreases gradually without automatic data handling systems but much faster with them



AUTOMATIC DATA SYSTEMS make direct operating saving of $0.19 per kw of capacity by end of fifth year



SAVINGS TO INVESTMENT RATIO is still very favorable even though it's been decreasing very slowly since 1957

Up to five years' experience with eight automatic data handling systems in six power plants justifies more applications by a company, J. O. Robichau, Gulf States Utilities Co, told the symposium of the Instrument Society of America recently in Chicago.

Robichau showed that the average direct operating saving through automatic data handling is $0.19 per kw of installed capacity at the end of the fifth year. Including fringe benefits, average fifth-year saving is about $357,000 on an investment of $1,330,000.

Robichau cited another tangible benefit—the reduction in instrumentation through automatic data handling. Gulf States, he said, eliminated about half of the standard boiler, turbine and pump instrumentation and about a third of the standard recording devices in the newest station equipped with data logging. Savings were an estimated $75,000 per unit in stations so equipped.

Automatic data handling also improves the efficiency of older units, Robichau said. For a 12,300-Btu-per-kwhr unit, the improvement is estimated at 225 Btu per kwhr.

The systems installed perform similar functions, including alarm scanning, with limit comparison, annunciating, and recording of off-normal conditions; hourly and on-demand logging of normal operating data; trend recording of measured and computed data; and, computations regarding integrations, averaging, flow compensation, linearization, heat rate, and efficiencies.

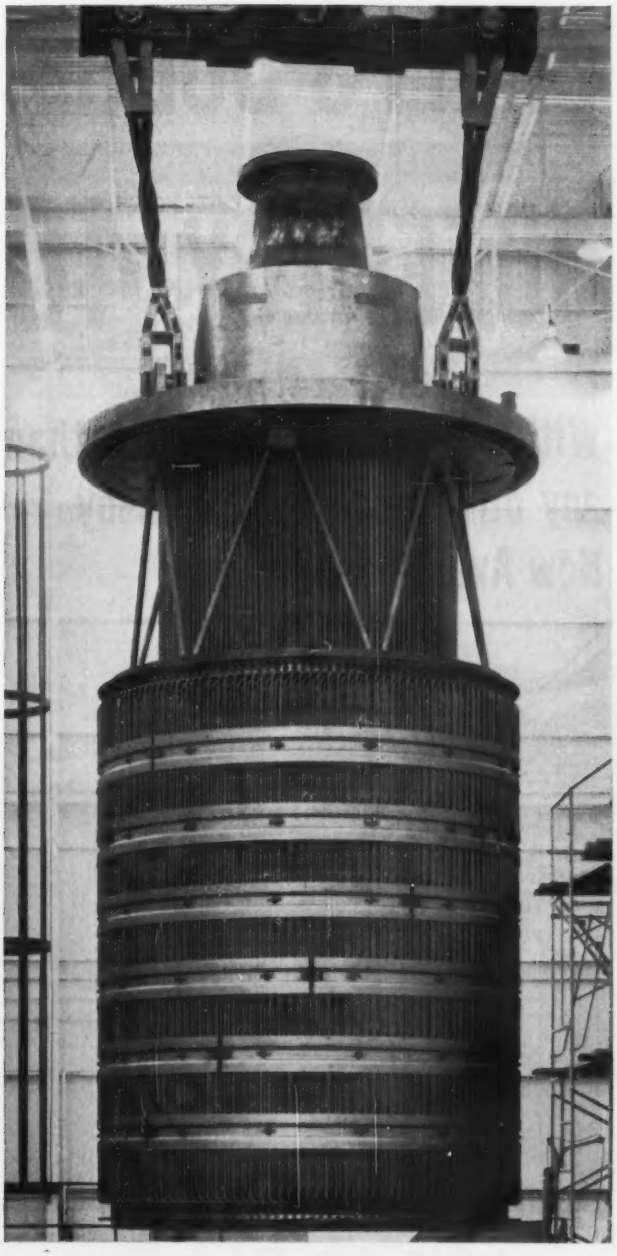
An automatic scan-logger and bearing temperature scan-annunciator made it possible to add two 111-Mw units without a manpower increase to the 265-Mw (six units) Neches Power Station.

When a 162-Mw unit was added to Nelson Station, a system was installed designed around a general-purpose digital computer. Only signal conditioning devices and input selection relays will have to be added to fulfill data system requirements for the next generating unit. Efficiency calculations for the two 111-Mw units at Nelson Station are performed by the computer, results being transferred back to the proper logger, both hourly and on-demand.

Another data system was installed at the new 162-Mw Willow Glen Power Station, which has 220-Mw units scheduled for service in 1964 and 1965. This digital computer system performs essentially the same functions as that at Nelson Station, Robichau commented. The last two data–handling systems installed, he said, have scan rates of 5 points per sec and about 250 inputs per unit.

The eighth data-handling application will be at the new 228-Mw Sabine Power Station, now under construction for service in 1962 with a second unit to follow in a year. In addition to handling previously described functions, this computer will be used to a greater degree in major cycle component monitoring and performance calculations.

TOMORROW'S POWER



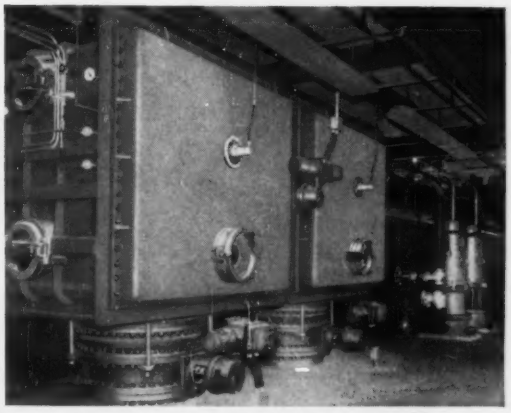
and

C. H. WHEELER / GRISCOM-RUSSELL

COMBINED INGENUITY

AND SKILL BUILT IT.

Three identical Griscom-Russell Vertical Once-Through Involute Tube, Liquid Sodium Heated Steam Generators (one of which is shown here)—have been installed and are being tested at the Enrico Fermi Power Plant built by the Power Reactor Development Corporation. These generators—first of their kind ever built—are an important break-through in the continuing efforts to produce steam from nuclear power more economically.



This 50,000 sq. ft. C. H. Wheeler Condenser at the new Indian River Plant of the Orlando (Florida) Utilities Commission, serves the 78,500 (rated capacity) turbine-generator. Its special deaerating features saved money in installation costs. C. H. Wheeler Ejectors, Circulators and the Condensate Pumps shown at the right also serve this new plant.

GRISCOM-RUSSELL / **C. H. WHEELER**

Massillon, Ohio — Philadelphia 32, Pa.

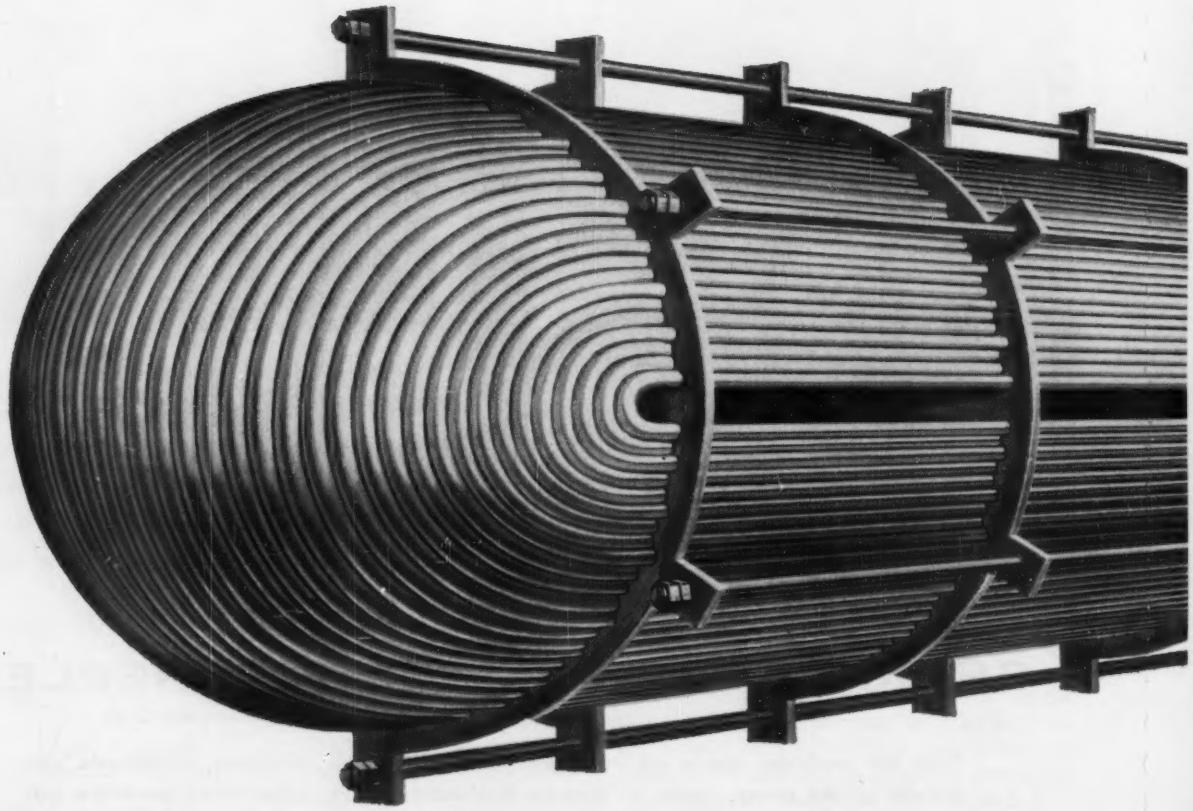
From this combined source you may now select condensers, circulating, condensate and general service pumps, steam jet ejectors, feedwater heaters, evaporators, generator gas coolers, tank heaters, heat exchangers, or special steam generators . . . all engineered and coordinated to meet the performance and space requirements of your power station.

Another New Extra High Strength
Condenser Tube Developed by

PHELPS DODGE!

CUFENLOY-40

With 15% Higher Strength than
any other Copper-Nickel Alloy
Now Available!



In August 1959, Phelps Dodge introduced the first high strength copper-nickel alloy condenser tube, Cufenloy-30. Now Phelps Dodge offers Cufenloy-40, a copper-nickel alloy with greatly increased strength suitable for the most severe applications in high pressure feedwater heaters. The mechanical and physical properties of this exclusive new alloy make possible substantial reductions in the cost of feedwater heaters. Cufenloy-40 has received approval for ASME Code applications through Case 1300 (Special Ruling).

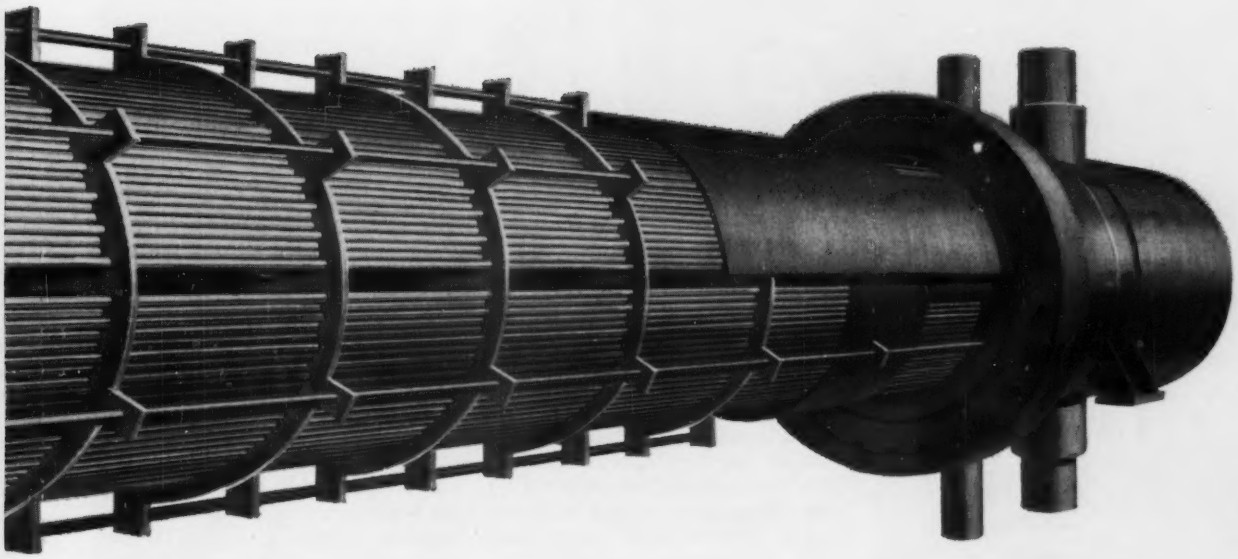
Weldability. Extensive tests in Phelps Dodge's laboratories were performed to determine Cufenloy-40's welding characteristics. Standard welding procedures used for 70/30 copper nickel tubes were found to be fully acceptable for this new composition. Pull-out, Cycling and Pressure Tests confirmed that a maximum joint efficiency was obtained using these procedures.

Corrosion Resistance. Corrosion studies have been performed on Cufenloy-40 since 1959 and have shown it to be unsusceptible to stress corrosion cracking in a moist ammonia and carbon dioxide atmosphere. In these tests Cufenloy-40 also proved virtually immune to general chemical attack. It is believed that Cufenloy-40 has the best overall corrosion resistance of the copper-nickel alloys.

Dual Gauge. Cufenloy-40 condenser tubes are available in dual gauges wherever a thickened wall section is needed to compensate for thinning on tight radius bends.

U-Bent Tubes. Cufenloy-40 tubes are also furnished in factory "U" bends for immediate tubing into the unit at the manufacturer's plant or on the job site.

Further Information from your local Phelps Dodge sales office, or write Dept. 2B for the Cufenloy-40 technical brochure.



PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 Park Avenue, New York 22, N.Y.

P D MINE TO MARKET

Power CB 'Action-Exhibit' Tours Utilities

TRIP-FREE MECHANISM is demonstrated by I-T-E engineer; 34.5-kv, 1,500-Mva, 1,200-amp breaker in background is operated in slow motion for the visitors

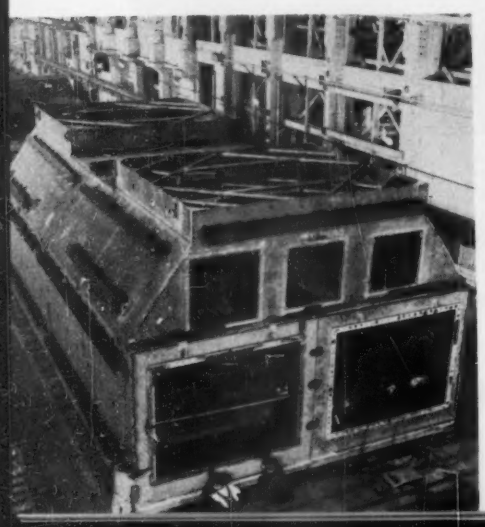
INTERNAL PARTS of 14.4-kv, 500-Mva, 1,200 amp breaker are exposed; breaker, connected to 15-kv disconnect switches, is operated at full speed

A 35-ft, air-conditioned display-on-wheels, featuring operational power circuit breakers and associated equipment, has just begun a one-year, cross-country tour for I-T-E power circuit breaker division, visiting utilities and industrial users of this equipment. The touring apparatus exhibit augments this manufacturer's initial "tour" (EW, March 20, p 78).

The completely self-contained mobile showroom is divided into three areas. In one area, a single tank 34.5-kv Trend-Line Breaker operates in slow-motion with all internal parts exposed. In another section, a 14.4-kv Trend-Line Breaker operates at full speed, also with all internal parts exposed for easy viewing. In a third area, the I-T-E Kool-Arc interrupter and other component parts are displayed.

The display can comfortably accommodate from seven to 12 guests at a time. Because of its mobility, the showroom can be wheeled up to the customer's front door, whereupon I-T-E trained personnel conduct a planned presentation of the various equipment.

The display began its nation-wide tour in April and will be on the road approximately a year, visiting all parts of the country. Further information, including the scheduled date the display will be in a particular city, can be obtained by contacting any of the local I-T-E district offices.

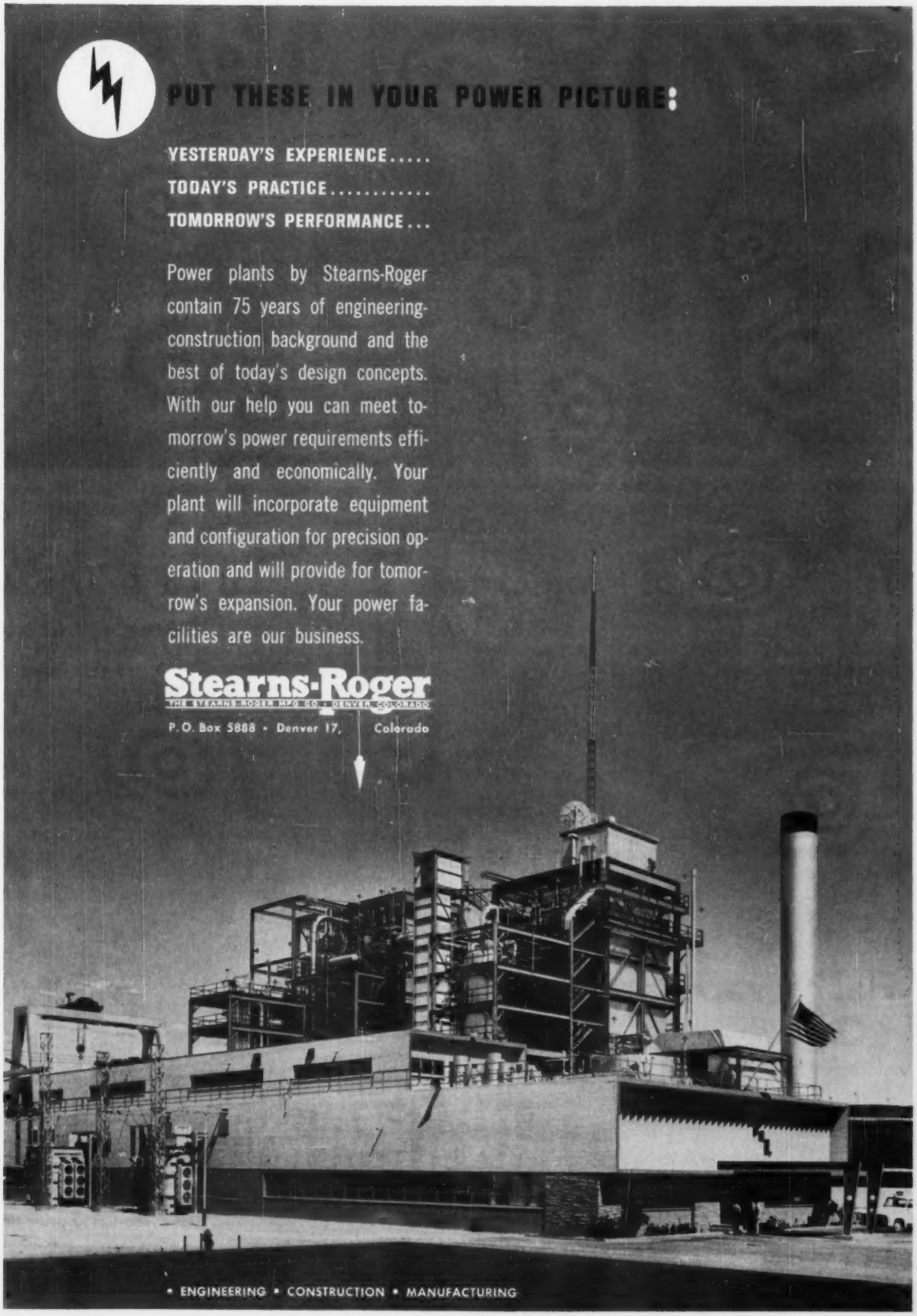


Large Condenser Bound for PG&E

The largest steam condenser ever built at the Westinghouse Electric Corp's Sunnyvale Division is shown here before being shipped to Pacific Gas & Electric Co's Morro Bay, Calif., electric generating plant. The apparatus is 24 ft high, 28 ft wide and 48 ft long. Assembly of 10,342 aluminum-brass tubes at the site will bring the weight of condenser and accessories to almost 500 tons.

In operation, 8,820,000 gal of ocean water flowing through the 94 miles of tubing will condense 1,420,000 lb of exhaust steam per hr. The unit is operated in conjunction with the boiler servicing a 330-Mw Westinghouse turbine generator. Workmen will separate the condenser into nine parts and load it aboard eight railroad flatcars at Sunnyvale, Calif., for the trip to Santa Margarita, Calif., where it will be trucked the remaining 25 miles to Morro Bay.

(*More News of Manufacturers, p* 64)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TODAY'S PRACTICE.....
TOMORROW'S PERFORMANCE...
Power plants by Stearns-Roger contain 75 years of engineering-construction background and the best of today's design concepts. With our help you can meet tomorrow's power requirements efficiently and economically. Your plant will incorporate equipment and configuration for precision operation and will provide for tomorrow's expansion. Your power facilities are our business.
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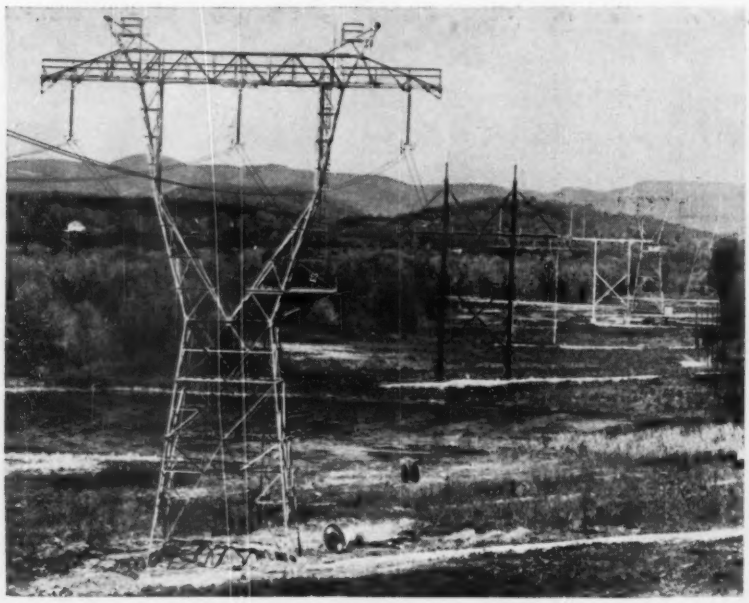


TELESCOPIC VIEW of six of the 18 transmission towers in Project EHV—towers are of wood, steel, and concrete of varied design and erection methods

DUMBBELL SPACERS (ALCOA) separate bundled conductors at Project EHV

Full Length of Project EHV Is Upped to 770 Kv

General Electric Co has operated the full, 4½-mile length of their prototype transmission system, Project EHV, at 770,000 v.

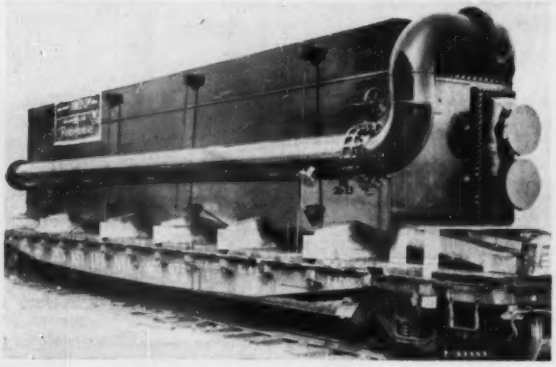
With conductors bow strung the remaining four miles of the south section, the voltage pushed beyond the December high of 720 kv, to 770 kv. The higher voltage was attained because of added capacitance which nullified a portion of the high inductive reactance in the supply circuit.

The 770 kv was applied briefly to test the insulators, conductors and 18 different transmission towers at the project. Continuous operation along the entire, open-ended line is now underway at 500 kv.

The 18 towers of the EHV project vary in materials, design, erection methods and foundations. Aluminum Co of America fabricated an all-aluminum tower. A tower supplied by the Prestressed Concrete Institute is considered to be the world's largest concrete transmission structure. A guyed V-type tower from Aluminum Ltd, is the largest of its type. A laminated wood structure, built by Rilco Laminated Products Division of Weyerhaeuser Co, is another world's "biggest." Other "firsts" in size, shape or materials are found in towers by US Steel, Commonwealth Associates and Anchor Metals.

Construction at Project EHV should end this summer. Only the south substation and the data acquisition section in the southern portion remain as major unfinished items. This second substation will enable the project to carry power for Pittsfield, Mass., and vicinity.

Flash Evaporator Shipped to TVA



The largest single-stage flash evaporator ever shipped in the United States has been transported by rail from the Westinghouse heat transfer department in Lester, Pa., and will be put into service at the Tennessee Valley Authority's Paradise Steam Station in Kentucky. The unit is capable of producing over 70,000 lb per hour (200,000 gal per day) of high-purity boiler-feed make-up water from raw river water. It is over 45 ft long, weighs approximately 60 tons and was completely factory-assembled and hydro-tested prior to shipment.

A second flash evaporator, identical to this one, will be shipped to the Paradise Station by Westinghouse in September.

Now... Metal-Clad Switchgear from MOLONEY

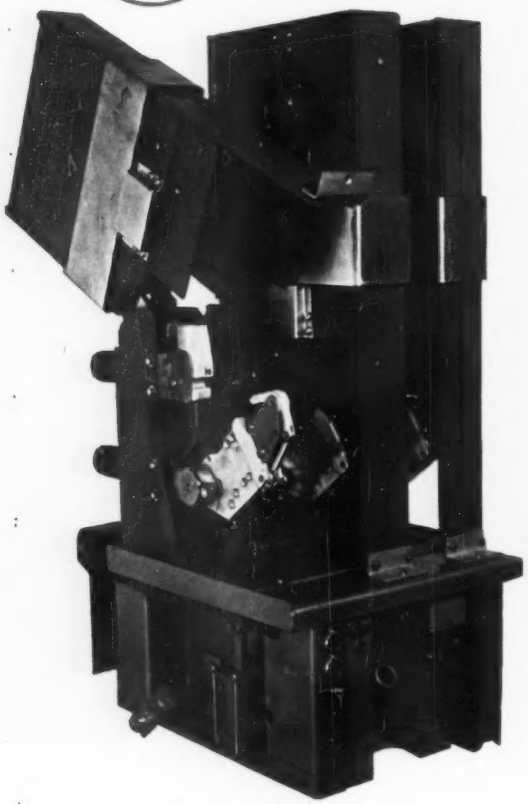
After Several Years Of Intensive Research, Moloney Introduces Its 5 And 15 KV Metal-Clad Switchgear Line To Meet The Needs, And To Minimize Problems In The Field. Smallest, Most Compact In The Industry . . . Easy To Install And Maintain. Creative Break-Throughs In Design, Material Application And Manufacturing Techniques Result In Outstanding Performance, Substantial Savings.

METAL M CLAD
Trademark

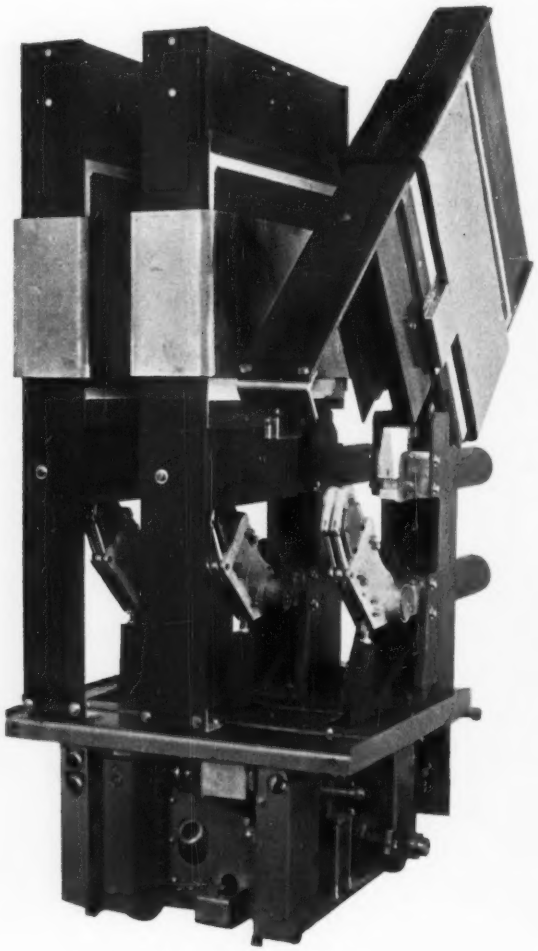
5 and 15 KV Production Units of Moloney Metal-Clad Switchgear Pass All Tests Successfully . . . Certifying High Efficiency Performance*

Moloney's decision to enter the switchgear field posed a formidable task: to formulate a creative, new approach to design and manufacture in addition to amplifying the desirable characteristics of switchgear previously available. These objectives dictated break-throughs in design, material application and manufacturing techniques . . . a fresh concept.

METAL M CLAD
Trademark



5 KV, 75 MVA, 1200 Amp.



15 KV, 500 MVA, 1200 Amp.

Moloney Metal-Clad Switchgear available for indoor or outdoor application, in all standard breaker ratings.

***KEMA Interrupting Test data available on request.**

Benefits of Moloney Metal-Clad Switchgear:

- **Superior circuit protection performance.**
- **Efficient use of all materials, resulting in economic benefit to the customer.**
- **Specialists, available to the industry, whose sole purpose is to help in the solution of circuit protection problems.**
- **Broadens your field of selection.**

The electrical industry has known the Moloney tradition of excellence for almost three quarters of a century. The same high standards . . . the same *"tradition of excellence"* is embodied in Moloney Metal-Clad Switchgear.

Exclusive and Distinctive Features

Moloney Designed and Developed*

COMPACT SIZE—NEMA Standard Moloney 5 and 15 KV Metal-Clad Switchgear requires smallest installation space. Typical 5 KV cubicle is 26″ wide, 58″ deep and 63″ high. Typical 15 KV cubicle is 36″ wide, 85″ deep and 75″ high.

EXCLUSIVE CONTACT DESIGN—Extremely high blow-on forces are obtained on *both* the arcing and main contacts. Arcing contact blow-on results from the geometry of design. Main contact blow-on is attained by means of a slotted block between the primary conductor and the stationary contacts which directs current flow in a loop. This results in solid contact pressure . . . lengthening contact life.

EXCLUSIVE PUFFER LOCATION—Hollow primary conductors permit location of puffer close to source of arc. Glass polyester puffer nozzle is stationary . . . directs blast of air toward arc the moment contacts part.

EXCLUSIVE PRIMARY CONDUCTOR INNERCOOLING—Innercooling results from hollow primary conductors which allow continuous circulation of air for best cooling of main current carrying components.

EXCLUSIVE BLOW-OUT COIL DESIGN—High dielectric strength, compound-face wound, cast in place, blow-out coils assure efficient arc interruption over full current range.

DUAL ARC INTERRUPTION—Series interruption arrangement splits arc for best arc control.

BREAKER MOUNTED AUXILIARY CONTROLS—Conveniently located on breaker frame. No separate testing controls are needed. Trip mechanism is located perpendicular to direction of shock, preventing erratic tripping. Dual breaker safety interlocks provide maximum safety for personnel.

ENCAPSULATED INSTRUMENT TRANSFORMERS—Modern space saving encapsulated instrument transformers are isolated from the breaker compartment. Encapsulated Current Transformers may be conveniently mounted on load and bus sides.

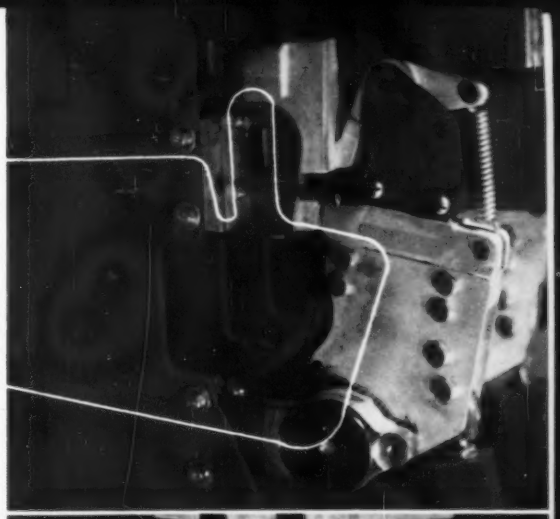
COORDINATED INSULATION SYSTEM—Coordinated insulation system meets individual component insulation requirements. Molded track resistant glass polyester insulation is used on 5 and 15 KV gear. Porcelain is applied on 15 KV gear in critical dielectric locations.

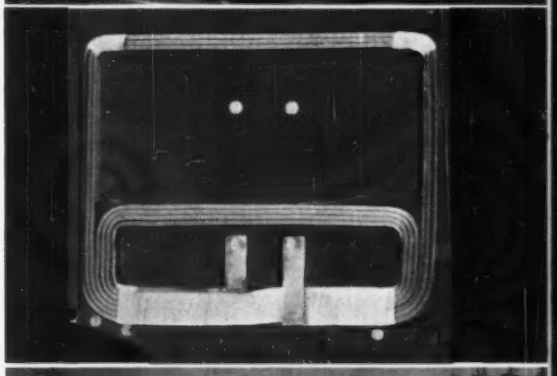
EXCLUSIVE STACK-FIRED BARRIER ASSEMBLY—Zircon arc chute barriers are stacked in uncured state, then cured and fused in one process to provide a mechanically stronger, more uniform, interrupter assembly.

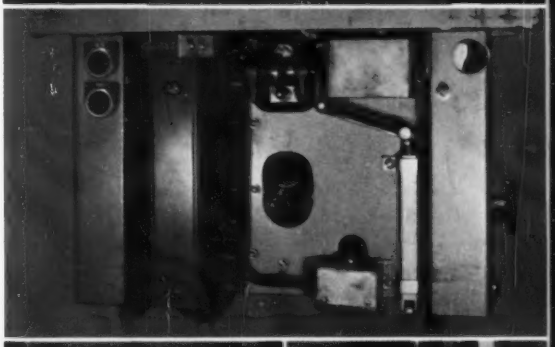
INTER-PHASE ISOLATION—Glass polyester insulation gives positive electrical isolation between phases. Magnetic cores afford magnetic isolation between phases.

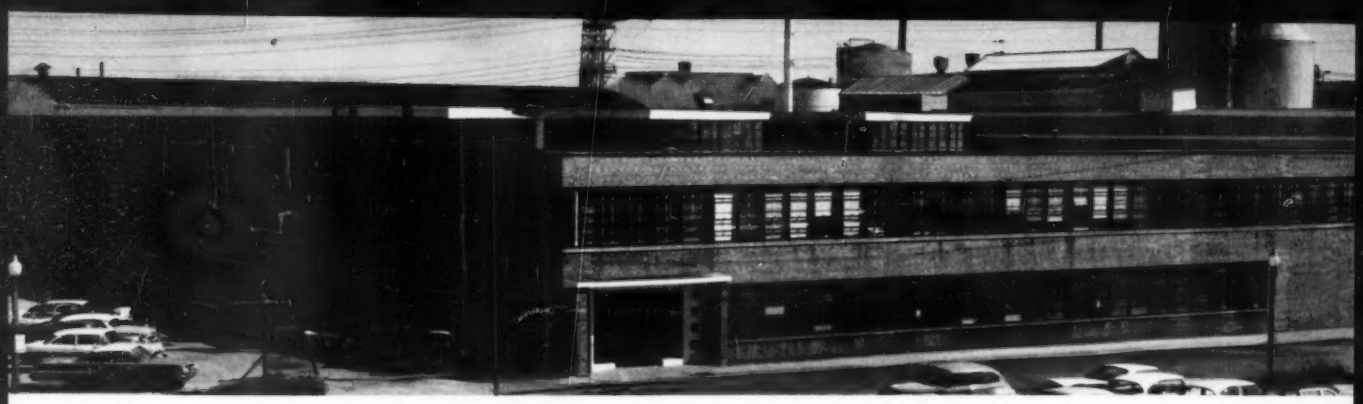
ACCELERATED ACTION OPERATING MECHANISM—Solenoid actuated mechanism provides maximum torque at end of stroke to insure positive contact closing.

*U. S. Patents Pending

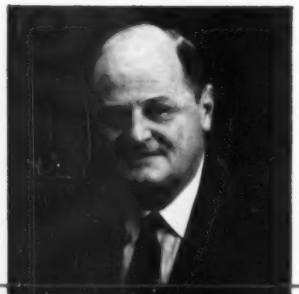








Moloney Switchgear Production facilities at 4330 Geraldine Ave, St. Louis, Mo.



"Establishment of Switchgear Division on the part of Moloney is, I believe, indicative of the company's faith in the future of the electrical industry, and demonstrates our ability and willingness to accept broader responsibilities as a major independent supplier of capital equipment to the industry."

T. O. Moloney, *Chairman of the Board*

"Our entry into the switchgear field reaffirms our position as a progressive company, with strong research and development resources for product innovation and improvement. The introduction of Moloney Metal-Clad Switchgear means that we are expanding our services to the industry, in addition to the specific benefit of bringing fresh, creative thinking to bear on circuit protection problems."

J. J. Mullen, Jr., *President*

"A blend of new engineering concepts and new production techniques, as incorporated in Moloney Metal-Clad Switchgear, brings into being a superior product at a competitive price. With the formation of Switchgear Division, Moloney Electric makes available to users, specialists whose sole purpose is designing, manufacturing and supplying Metal-Clad Switchgear of a quality level the industry has come to expect from Moloney."

D. E. Spackler, *General Manager, Switchgear Division*

"We have incorporated in our Metal-Clad Switchgear, engineering concepts and material applications which represent creative contributions and technical advancements to the art and to the industry."

C. E. Mercier, *Chief Development Engineer, Switchgear Division*

ME61-13

LITHO—U. S. A.

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Switchgear Division

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers and
Switchgear for Utilities, Industry, and Electronic Applications

4330 GERALDINE AVENUE, ST. LOUIS 20, MISSOURI

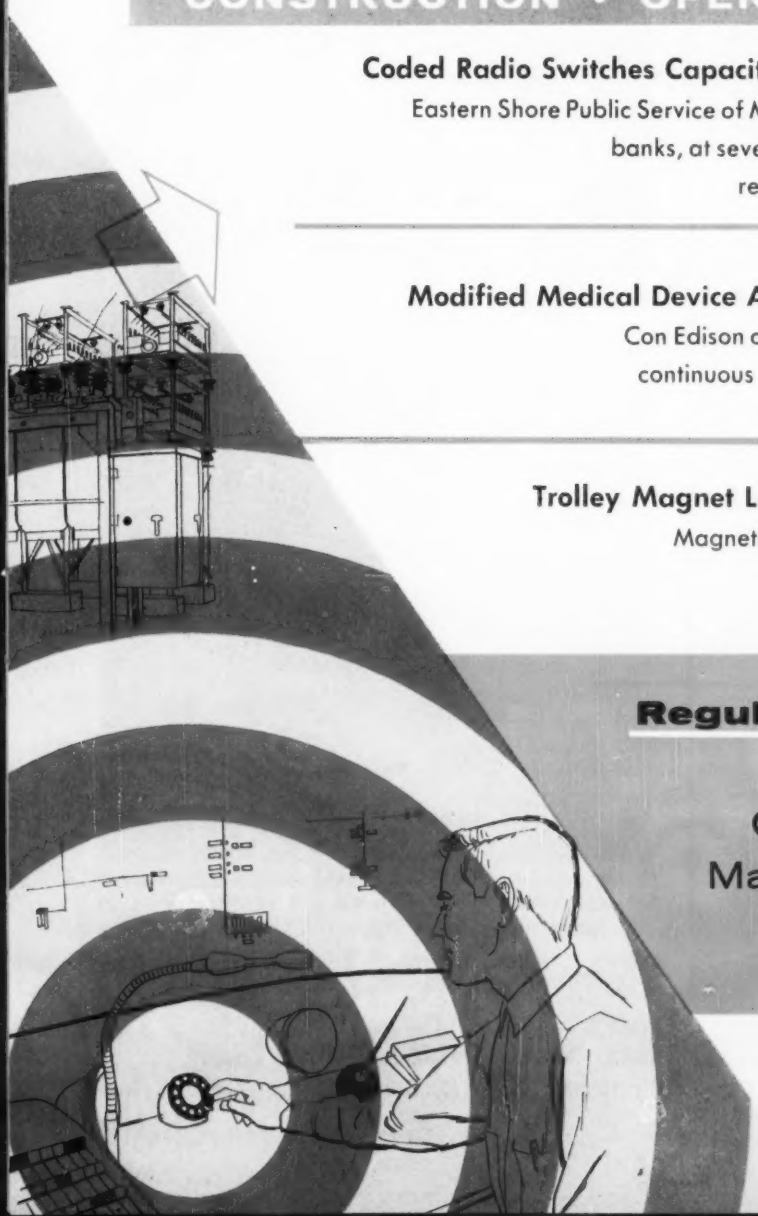
SALES OFFICES IN ALL PRINCIPAL CITIES

Electrical World Report

MAY-JUNE 1961

ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE



Coded Radio Switches Capacitors to Control System Reactive
Eastern Shore Public Service of Maryland radio-controls ten capacitor banks, at seven stations, for efficient adjustment of reactive during the exporting of 75 Mw — p 86

Modified Medical Device Automates Feedwater Analyses
Con Edison adapts medical colorimeter to achieve continuous automatic boiler feedwater analyses — p 88

Trolley Magnet Locates ACSR-Joint Steel Sleeve
Magnetic device developed at Central Power & Light Co quickly spots position of steel sleeve in faulty ACSR joint — p 90

Regular Departments

Construction — p 92
Operation & Testing — p 98
Maintenance & Repair — p 104
Stores & Shops — p 112
Safety — p 115

New Equipment — p 71
Manufacturers' Literature — p 116

FAST • SIMPLE • ECONOMICAL

UNISPLICE®

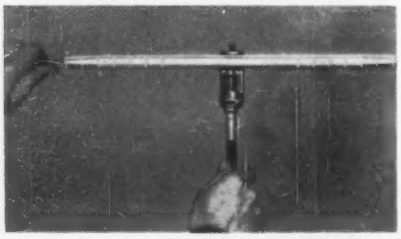
FULL TENSION HYSPLICE FOR ACSR

5 STEP 2-PIECE SPLICING

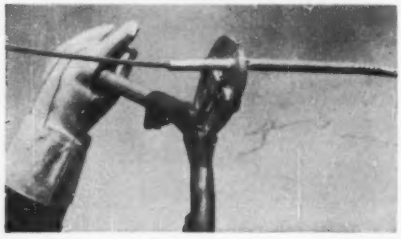
1. Aluminum strands must be carefully stripped back to the correct length. Care must be taken not to nick steel core.

2. Position of aluminum sleeve is marked on cable to facilitate subsequent centering over steel core. Lineman must then remember to slip aluminum sleeve onto conductor.

3. Steel sleeve is then crimped onto steel core.



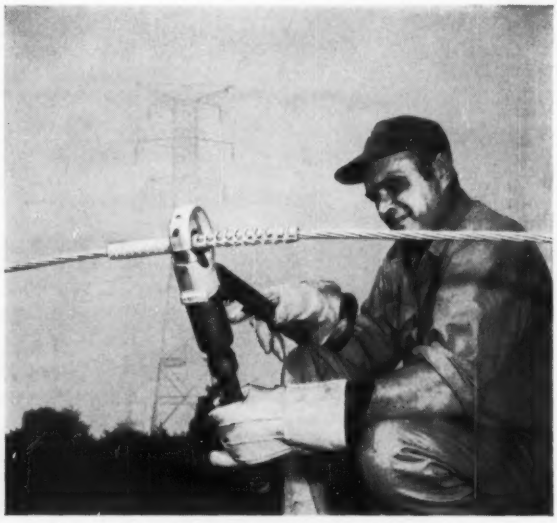
4. Aluminum sleeve is properly centered over steel core. PENETROX is pumped into aluminum sleeve thru filler hole.



5. Aluminum sleeve is finally crimped onto cable.

2-STEP UNISPLICING

1. Cables are inserted into one piece aluminum UNISPLICE. No stripping, no marking or centering required.



2. Install UNISPLICE using BURNDY MD5-3 Hytool or Y35 Hypress. UNISPLICE is factory filled with PENETROX. ®

WRITE FOR UNISPLICE BULLETIN

BURNDY

NORWALK, CONNECT. • TORONTO, CANADA

58-5

To obtain more information on these items, use code numbers indicated for the items when filling in Reader Service Card

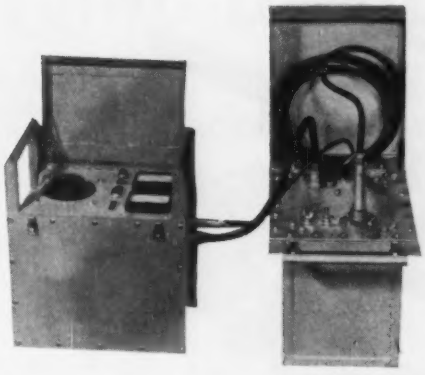
ELECTRIC UTILITY METHODS

NEW EQUIPMENT

Underground Cable Tester . . .

. . . reduces hazards and substantially cuts time required for most fault-locating jobs. Model XVD400-35-10C, designed around a high-voltage, portable power supply unit, provides 0.45-kv dc at maximum current of 35 Ma or 0.30-kv dc at 50 Ma—permitting use for cable proof testing, cable fault locating, fault reduction by burning and fault locating with a high-voltage Murray loop. Tester's two sections each weigh approximately 115 lb. A high-voltage switch shorts high-voltage output to ground when tester is shut off or tripped out due to overload. Input power required is 115 v, 60 cycles, single phase.

Davenport Mfg Div, Duncan Electric Co, Inc, 2530 N Elston Ave, Chicago 47, Ill. **(1)**



Ultrasonic Cleaner . . .

. . . provides larger capacity for meter cleaning and hardware salvage than previous bench models. Blackstone SG-3 ultrasonic system, with standard interchangeable tanks of 4, 5, and 8-gal capacity, offers smaller 1, 2, and 3-gal tanks from stock if increased sonic power density is desired. These extra tanks are used interchangeably and lift off stainless-steel-covered housing without interrupting electrical connections. Low-level drain with screw cap permits tank to be emptied while in operating position. A recessed, etched control panel features simplified controls and built-in timer to assure processing accuracy.

Blackstone Corp, Jamestown, N. Y. **(2)**

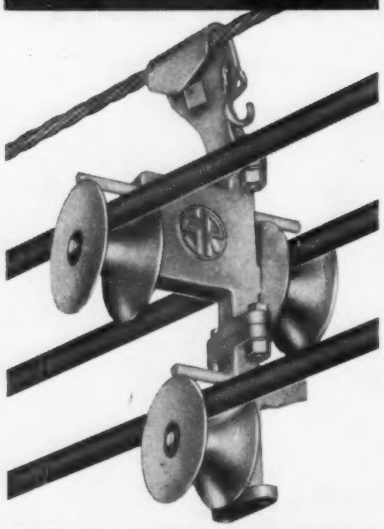
Front-end Loader and Backhoe . . .

. . . are available individually or in combination on the 550 tractor. The No. 568 loader has 3,700-lb breakaway and 1,800-lb lifting capacity and is available in SAE-rated bucket sizes of ½, ¾, and ⅞ cu yd. Its front-end attachments include a 72-in. backfill blade, tool bar, 1,000-lb-capacity fork lift and a crane capable of handling 1,000 lb. Backhoe, No. 71, has bucket sizes ranging from 12 through 36 in. wide, 2 to 5½-cu-ft capacities, and Easy Latch hookup, permitting detachment in minutes. A single hydraulic system provides power for both attachments, and the operator, from backhoe seat, can operate them simultaneously, maneuvering unit from one digging location to another for continued operation.

Oliver Corp, 400 W Madison St, Chicago 6, Ill. **(3)**

(More New Equipment on page 72)

SR
SPACER TYPE
Aerial Cable Block
MODEL MH-303



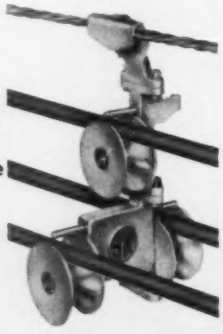
STRING DIAMOND
. . . or INVERTED WYE
One block does it all!

All Aluminum Alloy

Anti-Friction Ball Bearings For Easy, Accurate Sagging

Light

Versatile



New 1961 Catalog on Request

Sherman & Reilly, Inc.
ENGINEERS AND MANUFACTURERS
First and Broad Streets
Chattanooga 2, Tennessee
Telephone AMherst 7-1273

Exclusive Canadian Representative:
A. B. Chance Company of Canada Ltd.
Box 10 Toronto 13.

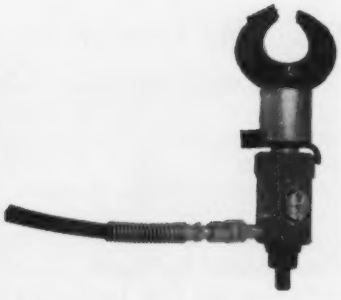
Safety Hat . . .

. . . features suspension assembly which is said to be stronger, 30% lighter and more comfortable than previous designs. Contrasted to as many as ten parts in other models, this hat has only the sweatband, sizing band and supporting crown. The suspension is made from new formula polyethylene, fortified against cracking under prolonged ultraviolet exposure. It provides better distribution of impact shock and fits any Apex safety hat now in service.
Boyer-Campbell Co, 801 W Baltimore, Detroit 2, Mich. (4)

'Hot' Ammeter . . .

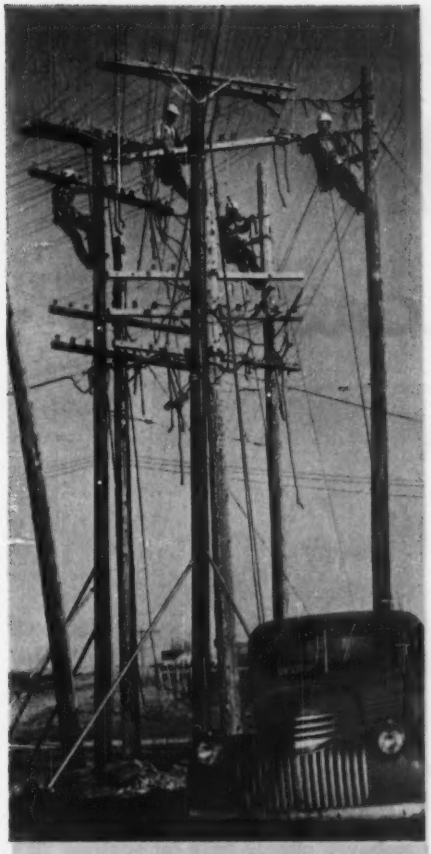
. . . provides 4% accuracy in the ranges 0 to 400, 0 to 100, and 0 to 40 amp, on high and low-voltage lines, through utilization of fixed air gap on the magnetic pickup core. Absence of moving parts on the pickup is said to allow the instrument to retain its accuracy with a minimum of maintenance. Special trigger sticks are not required for hot applications. The ammeter mounts on standard universal or extendo-type hot sticks.
Bodendieck Tool Co, Taylorville, Ill. (5)

Cable Cutter . . .



. . . employs "cutter-closer" which mechanically closes blade after cable insertion, said to reduce cutting time substantially. The hydraulic cutter will shear aluminum or copper cable, including tool assembly, up to 1,000,000 cm in less than 60 sec. It is available as a knockout set attachment or as a complete cutter set. In attachment form, the tool fits most knockout sets without change; with the addition of a pull rod it can be used any RC-112 or RC-426 ram. As a complete set, it includes cutting assembly, hydraulic pump, hose, ram, and carrying box.
Blackhawk Industrial Products Co, Butler, Wis. (6)

(More New Equipment on page 76)



Planned maintenance can delay for many years the expense of placing new poles.

HOW TO KEEP STANDING POLES STANDING LONGER

Three keys to an effective preventive maintenance program

Because of the continually mounting expense of setting new poles and transferring fixtures, there is no longer any doubt of the value of planned pole maintenance. Experience of utilities pioneering such work proves that supplemental preservative treatments will extend pole life many years . . . stretching maintenance dollars and deferring capital expenditures.

Success of such a program is dependent upon: 1) Regular and thorough inspections of standing poles. 2) Treatment as necessary with preservatives designed for this specific purpose. 3) Keeping accurate records of inspections and treatment.

The most widely used preservative products for pole maintenance are manufactured by Chapman Chemical Company. They contain pentachlorophenol, the superior wood preservative which gives proven results in preventing decay and insect attack.

With specific products for pole maintenance needs and broad experience in this field, Chapman can help you establish a complete program to insure best results at least expense.

USE THESE CHAPMAN PRODUCTS FOR SUCCESSFUL POLE MAINTENANCE

Pol-Nu® Preservative and Bandage-Maker

Pull out Pol-Nu bandage... wrap around pole.

Chapman Pol-Nu is a patented grease-type preservative containing a full 10% pentachlorophenol in solvent oils which meet AWPA specifications. It gives excellent penetration, is not water soluble. Pol-Nu is used for ground-line treatment and to prevent decay in checks and cracks above ground.

The Chapman Pol-Nu Bandage-Maker is a unique, portable device which prepares ground-line treatment bandages in the field. It insures a uniformly accurate Pol-Nu preservative application on every pole that is treated.

Pol-Nu Pak

Convenient ground-line treating bandage containing Pol-Nu. Factory-sealed envelope insures proper amount of preservative, is easy to apply. Handy for spot treating and "change-outs" as well as full-line treatment.

Pol-Kap and Applicator

The Pol-Kap is a permanent preservative topping for poles which seals out moisture and releases pentachlorophenol into wood to kill decay. Easily, safely applied with special applicator which locks on end of hot stick.

Penta Plus 40

Oil solution of pentachlorophenol for full-length pole and cross-arm spraying, and brush or soak treatments at retirement yards. Penta Plus 40 restores preservative protection economically.

CHAPMAN®

CHAPMAN CHEMICAL COMPANY

Leading manufacturer of wood preservatives

Memphis 1, Tenn.

Mail coupon for information

Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.

Please send complete information on products for pole maintenance to:

Name_____

Company_____

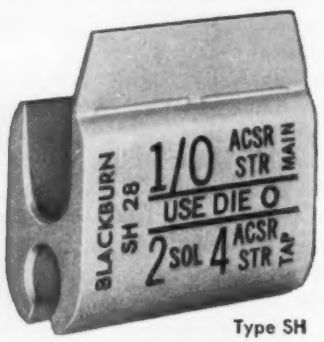
Address_____

_____

ENGINEERED INTO
BLACKBURN'S
COMPRESSION CONNECTORS

High Conductivity-

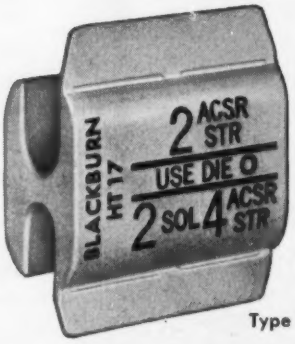
Blackburn has engineered all compression connectors shown to fit your present tooling program—and added advantages to meet engineers' and linemen's requirements.



Type SH

Type HT Prefilled

Type SH Prefilled

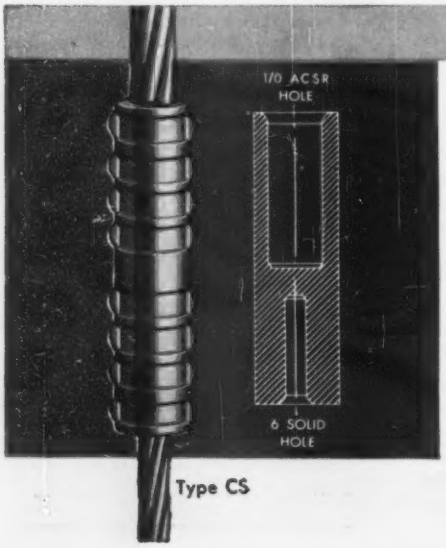


Type HT

Standardization now possible with Blackburn "H" frame connectors

- **Designed to fit the tools you already have for applying "H" frame type connectors.**
- **Full length tab completely seals out moisture, easiest to bend and install!**
- **Surface treated to impro e conductivity and retard corrosion.**
- **Prefilled with Blackburn's superior oxide-inhibiting compound, Contax, in easy-tear tab vacuum package.**
- **Color fast, large, easy-to-read lettering.**
- **Type HT is reversible, both grooves "open". For large aluminum tap to smaller copper main. Also used for dead ending.**

Licensed under U. S. Patent No. 2,707,775



Type CS

You get higher conductivity with Blackburn service entrance sleeves

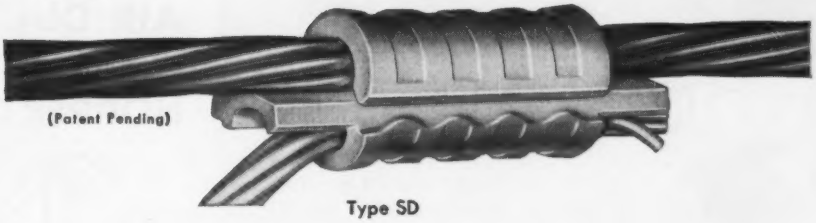
Blackburn—and Blackburn *alone*—provides greater contact area where needed, to assure greater conductivity. This is accomplished by increasing hole depth as the diameter of the conductor is increased, thereby providing more contact area for the conductors being connected.

The Color Coding is *printed* for quick, positive identification.

The sleeves' ends are sealed with Aluminum Sensitized Tape, which is easy to puncture . . . and, if a particle of the seal is pushed into the chamber, the particle is conductive.

Contax, Blackburn's superior oxide-inhibiting compound, is already in these sleeves *in measured amount.* Won't squirt out on glove or in face. And the solid center stop in a Blackburn Sleeve assures proper distribution of the inhibitor around the conductors. Designed for tooling you have.

High "Use-Ability"

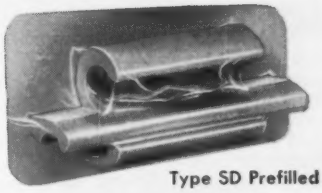


(Patent Pending)

Type SD

Exclusive drip-guard separator in Blackburn 6-frame tap connector gives *extra* protection to bi-metallic connections

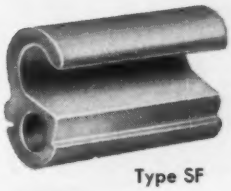
- Spacer allows SD Connector to be used for bi-metal connections with the tools you already have for "C" Frame type connectors.
- An economical substitute for "L" taps, since extended drip guard gives extra insurance against corrosion products bridging the bi-metallic gap.
- A true *two-handed* connector, very adaptable for hot line work.
- Surface treated for highest conductivity and corrosion resistance.
- Prefilled with Blackburn's Contax and vacuum packed for insurance against corrosion.



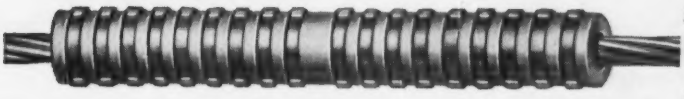
Type SD Prefilled

Type SF

- Recommended for aluminum to aluminum.
- Spacer gives better protection against strand breakage.
- Can be installed with same tooling used for Type SD.
- Prefilled with Blackburn's Contax and vacuum packed for insurance against corrosion.



Type SF



Type TR

Blackburn neutral repair sleeves save dollars on triplex services

- Salvage short lengths of pre-assembled service drop cable with Blackburn Sleeves.
- Designed for and tested with the tools you already have.
- Extra length engineered for neutral pullout values in keeping with dead end devices.

See JB Catalog 858 for Tooling INFORMATION

LIVE BETTER ELECTRICALLY

JASPER BLACKBURN CORPORATION

1525 Woodson Rd., St. Louis 14, Mo. • WYdown 3-9430

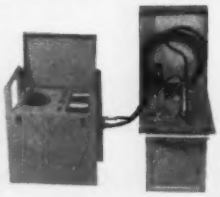
NEW

SAFE... POSITIVE WAY TO TEST CABLES— LOCATE FAULTS

NEW Cable and Phase Identifier System

No more dangerous cable spearing, disconnecting transformers or disturbing armor or sheath. Also reduces hazard of working around energized cables . . . cuts cable outage time . . . reduces cable labor costs. System consists of capacitor discharge transmitter and battery operated transistorized detector. Used for identifying all types of cables including control cables and the positive identification of phases.

NEW Portable High Voltage Power Supply



Two-unit system for safe, quick and positive underground cable testing and fault locating. Rugged construction for use in the field. Designed for use with any of following accessory equipment.

- High Voltage Booster Unit
- Condenser Discharge Fault Locator
- High Voltage Fault Locating Murray Loop
- Induced Voltage By-Pass

Write for new Catalog No. 61A.

Davenport

DAVENPORT MANUFACTURING DIVISION
DUNCAN ELECTRIC COMPANY, INC.
2530-2 N. Elston Ave. Chicago 47, Ill.

Scrubbing Machine . . .

. . . operates on battery power to clean an 18-in. swath. Operating speed is approximately 120-132 ft per min and scrubbing speed 3,500 to 6,000 sq ft per hr. Compact Scrubber-Vac Model PS-18BP scrubs, picks up dirt and cleaning solution, and squeegee-dries floors. It is designed primarily for use on medium-size flood areas up to 20,000 sq ft. Operating on two 12-v batteries, it weighs 360 lb, and has vacuum tank with 6½-gal recovery capacity.

Clarke Floor Machine Co, 30 E Clay Ave, Muskegon, Mich. (7)

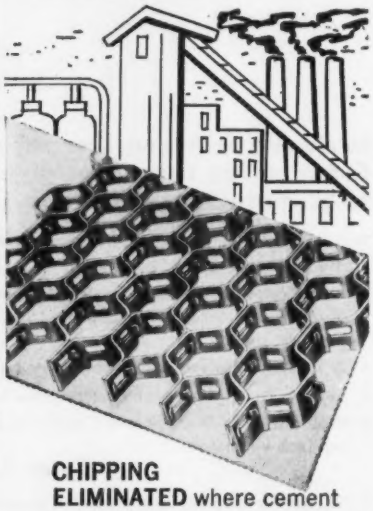
Magnetic Level . . .

. . . is designed for all-purpose leveling of flat and curved surfaces, leaving both hands free. Lev-L-All has one easy-to-read bubble enabling an accurate 45 deg, 90 deg, or horizontal reading, eliminating need for at least three bubbles for same readings in conventional levels. It also acts as a line level. Alnico permanent magnets are concealed in level's plastic body, which is heat, cold and moisture-resistant. Unit is 3⅜ in. long, 1½ in. high and ⅞

GRIDSTEEL®

GREATLY REDUCES MAINTENANCE of cement linings in

- ★ INDUCED DRAFT FANS
- ★ PRIMARY AIR DUCTS
- ★ FLY ASH HOPPERS



CHIPPING ELIMINATED where cement surfaces are subject to vibration, erosion, temperature changes, and abrasion.

STRESS RELIEVED CEMENT is obtained by the pre-cracking effect of using GRIDSTEEL hexagonal mesh ¾" or 1" deep. Gridsteel transfers the stress to the outside of the hexagonal cells.

ECONOMICAL thru low cost and ease of installation.

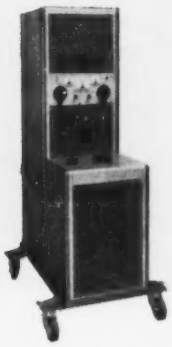
GRIDSTEEL is available from stock.

SEND NOW for full information and catalog.

IRVICO

IRVING SUBWAY GRATING CO., Inc.
Originators of The Grating Industry Est. 1902
Offices and Plants at:
5067 27th St., LONG ISLAND CITY 1, N. Y.
1867 10th St., OAKLAND 20, CALIFORNIA

in. wide—readily carried in belt pouch available.
Alan-Lea International Inventions Corp, 380 Lexington Ave, NYC 17. (8)



Testing Console . . .

. . . has 34 ranges, from 5 to 6,000 amp, for testing instrument transformers. Uniload current transformer tester, Type GCT-1, is a complete testing facility which is said to offer great convenience and safety, as well as unusual speed. It is composed of a heavy-duty current-loading transformer, precision multi-range current transformer standard, built-in ASA standard burdens.
Knopp, Inc, Oakland 8, Calif. (9)

Drill Bits . . .

. . . which enable linemen working on poles or platforms to use impact wrenches for hole-boring as well as nut-tightening operations, speed and simplify pole work. The No. 159-W single-twist bits feature a heavy 1⅝-in. long shank which fits any standard ⅝-in wrench adapter. A deep retaining recess in the shank snap-locks the bit into the quick-change chuck on the impact wrench. Coarse screw point, one spur, and one side lip are said to help assure long service. Eleven stock sizes are available from 3/8 to 17/16-in. dia and up to 18 in. deep.
Greenlee Tool Co, Rockford, Ill. (10)

(More New Equipment on p 80)

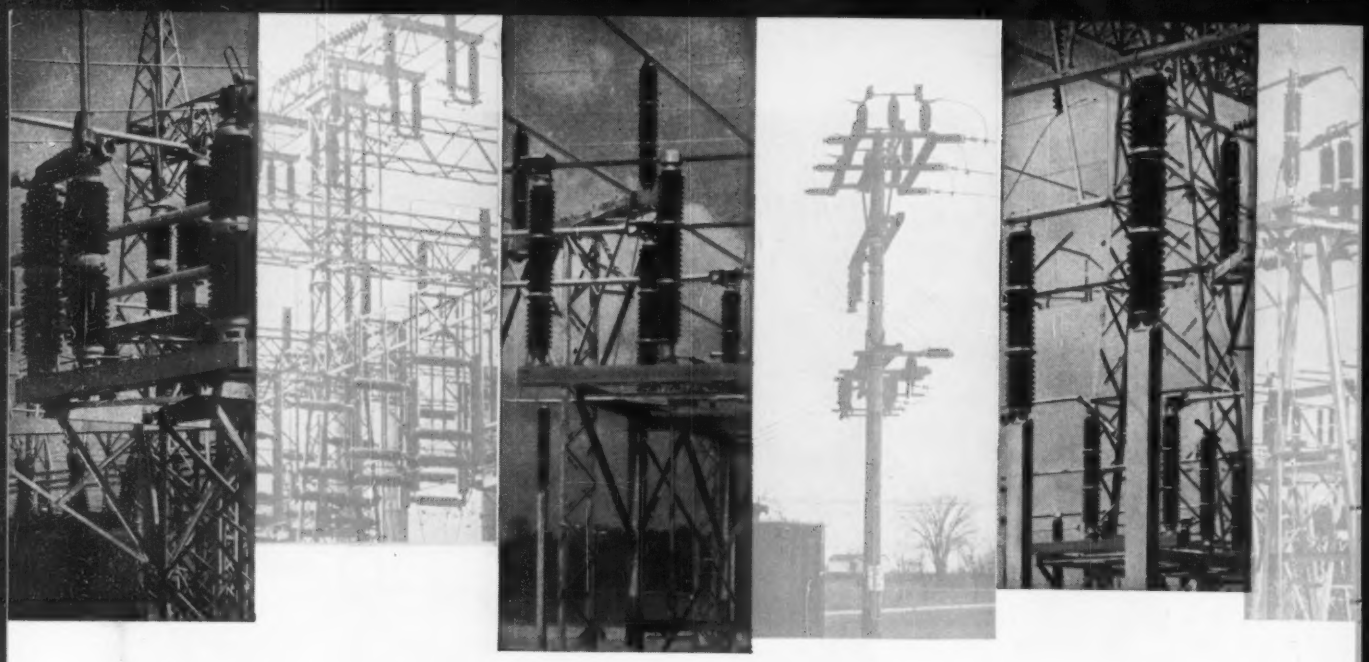
WESTERN RED CEDAR POLES

They're Safe, Clean to Climb and Deliver Many Added Years of Trouble-free Service

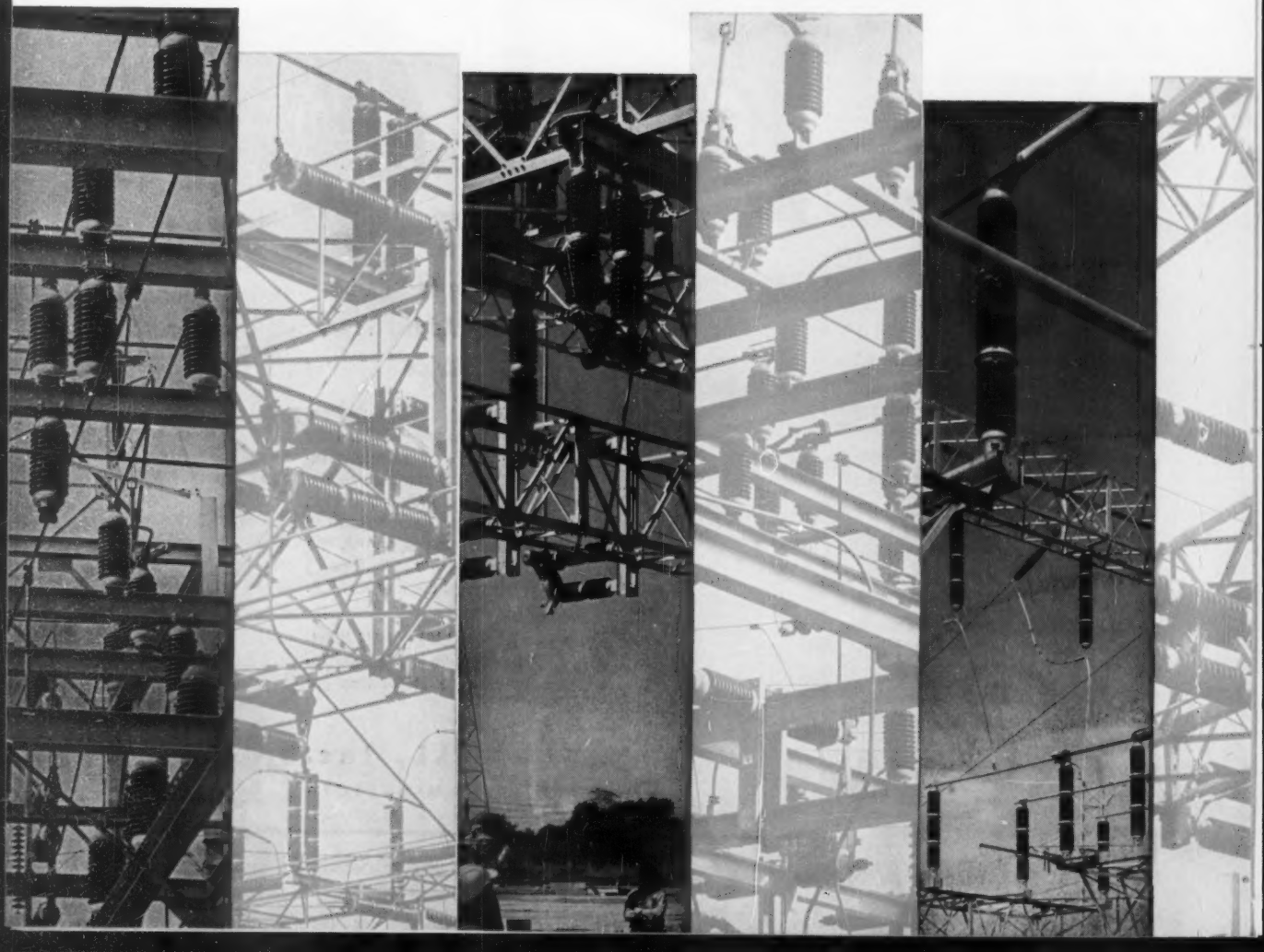
LIFE-SPAN Western Red Cedar Poles are clean and protected from top-to-butt. They are the result of years of continuous research and are **completely** immune to decay. To serve the utility industry better, Page & Hill maintains three mechanized yards with modern handling equipment. The LIFE-SPAN treatment applied to P&H poles complies with all approved E.E.I. or A.W.P.A. Thermal specifications.

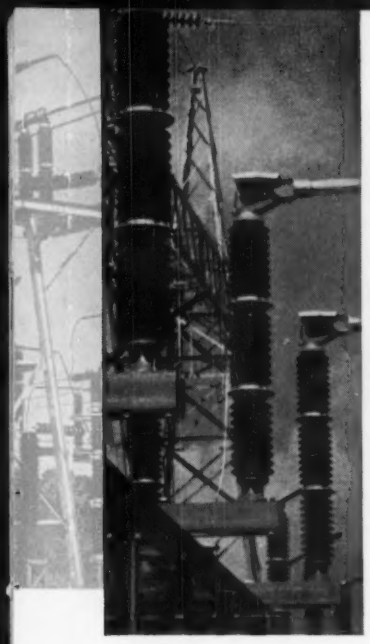
When you buy — specify LIFE-SPAN Western Red Cedar Poles! They're your assurance of longer pole-line service at far less per annum cost.

PAGE & HILL, Inc.
MINNEAPOLIS 3, MINNESOTA

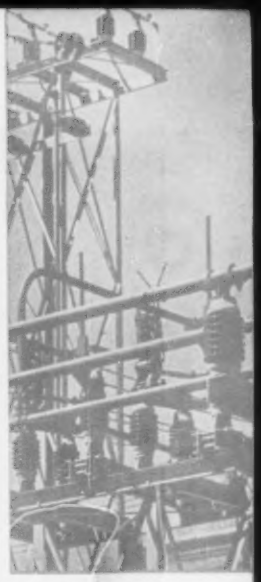


When you design with Lapp Station Posts....

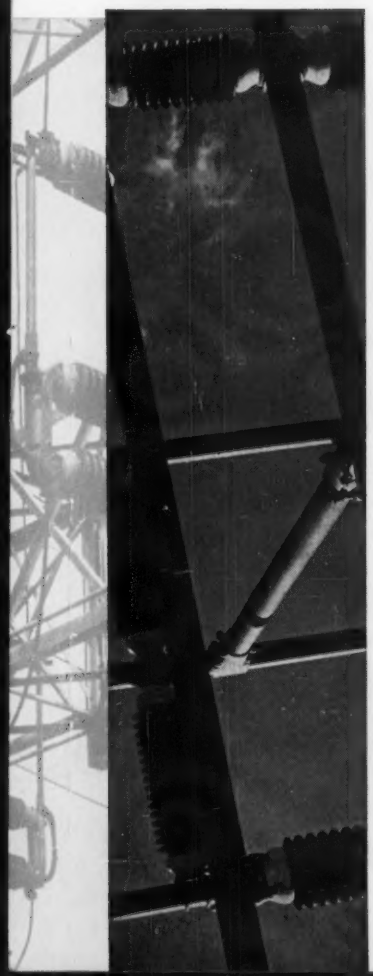




Voltage Rating kv	BIL, kv	Cantilever Strengths, lbs.		
7.5	95	2,000	4,000	8,000
15	110	2,000	4,000	8,000
23	150	2,000	4,000	8,000
34.5	200	2,000	4,000	8,000
46	250	2,000	4,000	8,000
69	350	1,500	4,000	6,000
115	550	1,700	2,900	4,000
138	650	1,450	2,450	3,900
161	750	1,200	2,000	3,500
	900	910	1,450	2,750
	1050	750	1,170	2,300
	1300		1,000	2,000
	1470		900	1,750
	1640		770	1,550
	1800		680	1,400



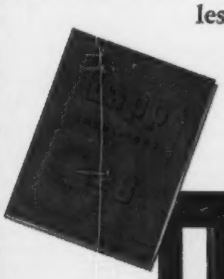
.....you can have what you want in BIL, in strength, in stiffness



Use of Lapp Station Posts frees designers of modern substations from the need to design around characteristics—and shortcomings—of conventional switch and bus insulators.

The family of Lapp Station Posts is a "modular series" which gives widest range of insulation levels *and* strength ratings. Station Posts are smaller in diameter, too . . . lighter in weight . . . stiffer . . . easier to assemble; and they're suited to mounting horizontally, underhung or angled . . . available in strengths greater than have ever been offered in conventional pin-cap units.

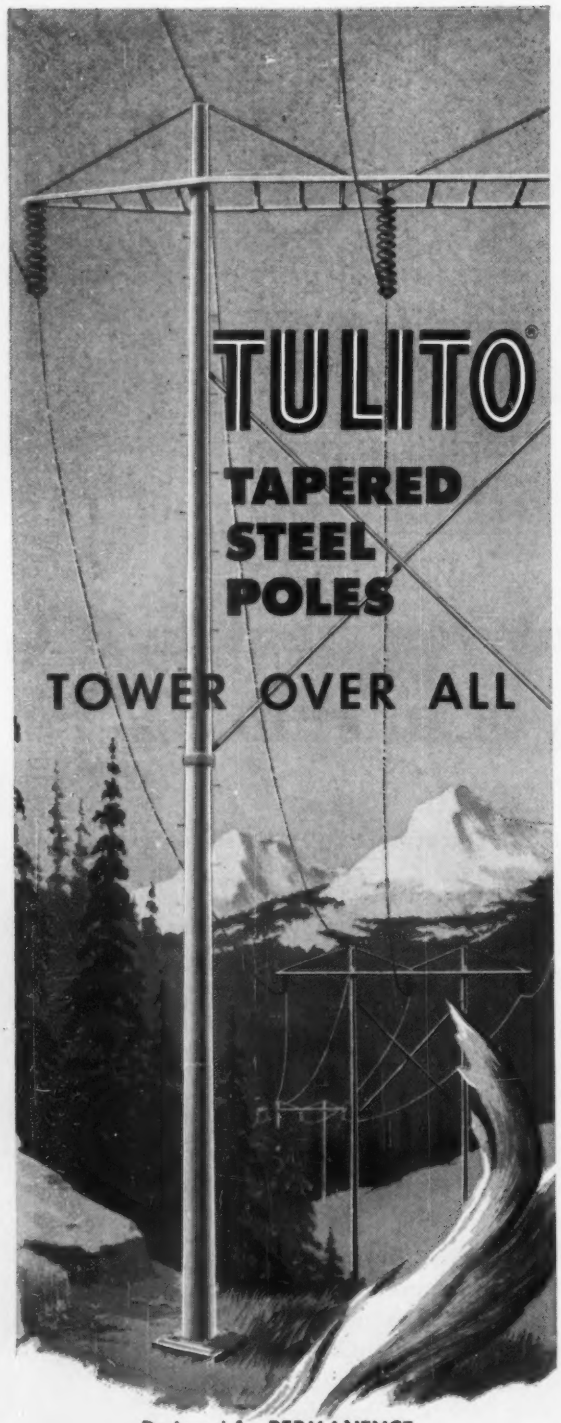
Stations on Lapp Station Posts require less real estate, less steel work. And, because their performance is better under all electrical conditions and mechanical loading, they need less maintenance too. You should have the whole story. You can read it in the new Lapp Catalog No. 8. If you haven't a copy, we'll be glad to send one.



Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

CIRCLE 79 ON READER SERVICE CARD



Designed for **PERMANENCE**
Engineered for **DEPENDABILITY**
Equipped with Tulito Safety Clamps to
insure workman **SAFETY** ascending—descending

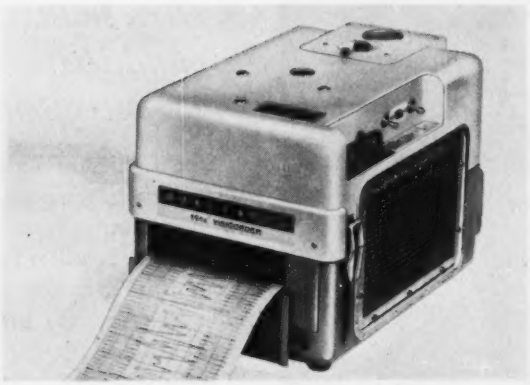
Available with either steel or wood cross arms. For complete information write:

MEYER MACHINE, INC.
RED WING, MINNESOTA

Pole Straightener . . .

. . . quickly and easily straightens poles where earth has softened or caved. Power for the Trott's directional tree faller is provided by a built-in hydraulic ram, which on the smaller model is 1½ ton. Shaft of straightener is adjustable, with a 13½-in.-sq base plate with sod teeth. It retracts to 4 ft 3 in. and extends to 6 ft 8 in. The faller also is said to be useful for right-of-way clearing and for safety controlling direction of fall of heavily-leaning trees. It can fill in as an emergency truck jack and the hydraulic power of the ram may be utilized in other applications.

Idaho Northwoods Co, Sandpoint, Idaho (11)



Direct-Recording Oscillograph . . .

. . . records at any of three intervals, producing full-width lines on recording paper. Visicorder portable oscillograph 906C has a timing circuit which can be triggered externally, either by supplying pulsing voltage at 10-v at 20K-ohm impedance or by causing impedance to drop to 100 ohms or less through shorting out or other means. Units will record up to 14 channels of test data simultaneously. Speed of the recording paper may be changed during operation.

Minneapolis-Honeywell Regulator Co, Heiland Div, Denver 22, Colo. (12)

(More New Equipment on p 82)

Step I — Installing PRIMAX-I-METER on conductor by means of one hot stick.

Step II — PRIMAX-I-METER positioned on conductor.

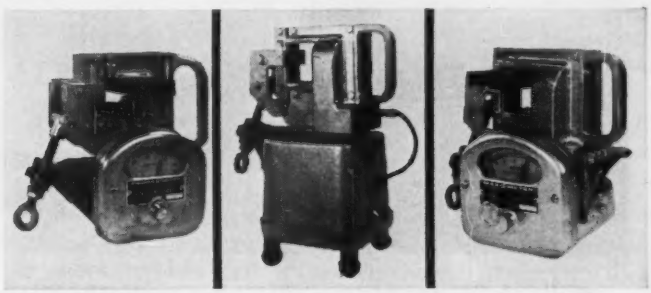
Step III — Tightening of eyebolt closes split-core transformer.

Step IV — PRIMAX-I-METER installation now complete, hot stick is removed from instrument fitting. The maximum demand hand of the PRIMAX-I-METER can be reset to zero by means of this same hot stick.

WHERE'S THE *Second Stick?*

You don't need it. HD Electric instruments are all equipped with a *single* hot line fitting that nests into "Grip-All" heads of hot line sticks firmly and securely. Skillful engineering and manufacturing ingenuity developed this major improvement to save installation time, insure safer hook-up conditions and conserve manpower. When using HD instruments on primary circuits, no more time is required than during manual installation on safe secondary circuits.

Other quality benefits built into HD instruments are their lightweight portability, accuracy, combination of uses, large easier-to-read scale plates and over 28 years of continuous specialization and experience in serving the electrical power industries. Write today for a complete set of our latest technical data and price sheets.



PRIMAX-I-METER

Measures and registers maximum current from 0 to 45 amperes. Split-core design permits measurement without interruption of service.

INVERTED SCALE MAX-I-METER

A unique instrument with meter element housing facing down, for more flexibility in field application and scale reading from ground level.

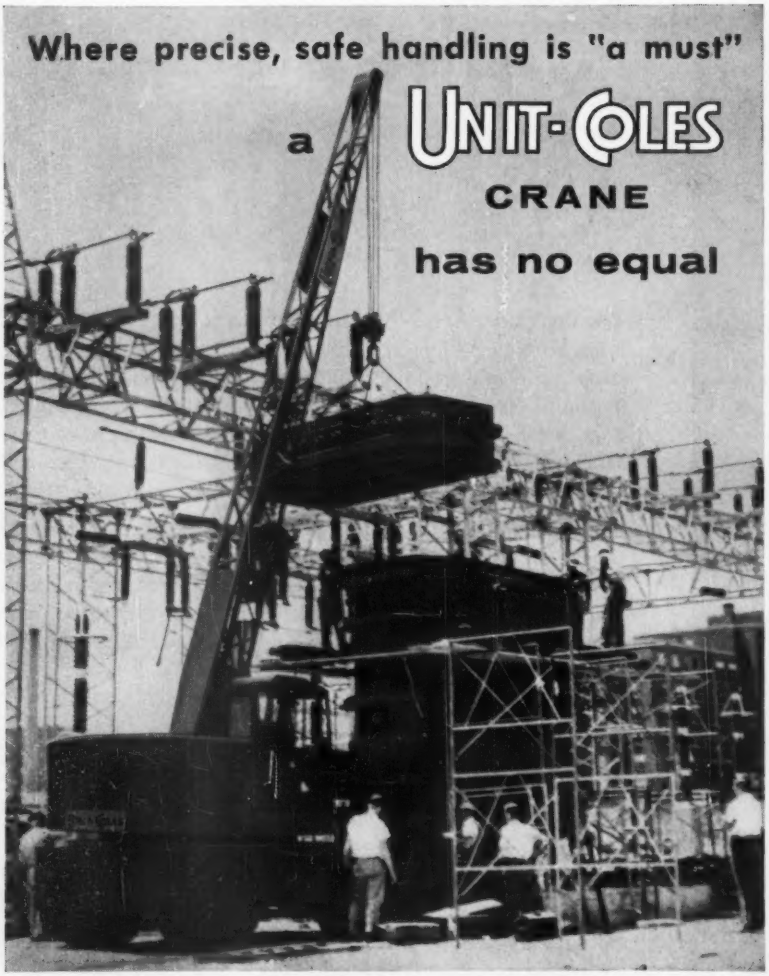
HOT LINE MAX-I-METER

Registers and records in 30 minutes the maximum amperage flowing through conductor. An instrument with hot line combination of instantaneous and maximum demand scale is also available.

BULLETINS SENT ON REQUEST

HD ELECTRIC COMPANY
Electrical Testing Equipment

P. O. Box 633 • 760 Osterman Ave. • Deerfield, Illinois



■ Substation repair or renovation often involves handling expensive, damageable electrical components in energized areas. Because there is no margin for error, precise handling with safety is "a must". On both counts — accuracy and safety — a UNIT-COLES crane offers you unmatched advantages.

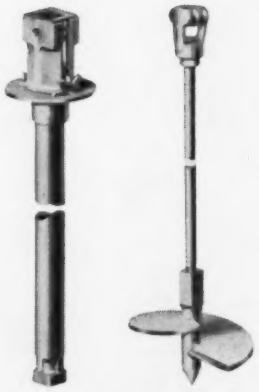
■ Generating its own power by means of an engine-generator unit, the UNIT-COLES crane is electrically controlled and operated. Individual electric motors provide fully independent or combination control of all crane motions. The crane operator has infinite speed control at his command. He can raise or *lower* a load at less than a foot per minute with pinpoint precision, or run "wide open" at speeds up to 150 f.p.m.

■ Utmost safety is assured by a positive-action Safe Load Controller with a "stop and hold" function that automatically prevents overloading. Easily adjustable limit switches, by prohibiting dangerous over-travel, assure that load and boom avoid nearby "hot" lines. These outstanding safety features together with "fail-safe" *automatic braking* and "*dead-man control*" on all crane motions make a UNIT-COLES *the world's safest crane.*

■ UNIT-COLES cranes, self-propelled or truck-mounted, are available in capacities ranging from 5 to 55 tons. Why not take a tip from the scores of electric companies who have already found *this crane* to be *the perfect answer* to their handling needs? Write today for full details!

UNIT-COLES
THE WORLD'S SAFEST CRANE

UNIT CRANE & SHOVEL CORP.
6711 West Burnham Street
Milwaukee 19, Wisconsin



Screw Anchors . . .

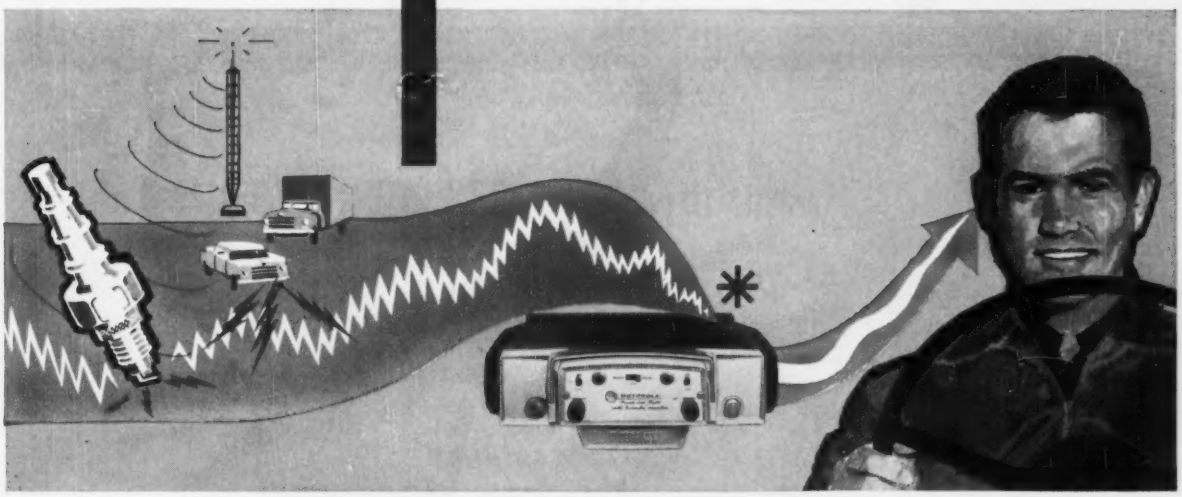
. . . provide positive holding power, due to minimized earth disturbance during installation and increased helix diameters. PowerDrive screw anchors are installed in a few minutes with a power digger. More consistently dependable and stronger anchoring is said to be attainable because of elimination of usual installation variables—digging, expanding, backfilling and tamping. **Hubbard & Co, Box 61, Lyons, Ill. (13)**

Field Drafting . . .

. . . can be achieved with Pocket Polyangle, which comes complete with carrying case and instructions. It adjusts to a pad for accurate field sketching or drawing to scale, yet is pocket size when folded in its case. Main scale slides to provide parallel horizontal lines. Spring-loaded angle arm can be snapped into positions of 30-45-60-90-120-135-150 deg, either above or below the horizontal and can be moved horizontally while maintaining angle setting.

Country Engineering, Inc., Darien, Conn. (14)

new...Motorola MOTRAC radio with EXTENDER operation



✳ CUTS OUT IGNITION NOISES

Dramatically Improves Overall Efficiency In 24-50 mc 2-Way Radio Systems

Motorola MOTRAC radio with Extender operation puts ignition noise suppression where it does the most good—built right into the receiver. Here it suppresses ignition noises from your own vehicle as well as those in the vicinity...providing the answer to the biggest problem in low-band 2-way radio systems today.

First and foremost, Extender operation improves reception throughout your system. In as much as ⅘'s of your territory, ignition noises can garble your messages. Now messages are clear. "Hash" caused by ignition noise is gone. *Second,* you can "extend" useable operating range where ignition noises are high. Motorola Extender operation suppresses disrupting ignition noise on weak, fringe area signals allowing the message to come through clearly—right out to the limits of your radio coverage. *Third,* you can reduce interference from other radio systems (extraneous messages, ringing and other noise interference known as intermodulation)... just flip the switch on the control head.

"MOTRAC" is a trademark of Motorola Inc.

HEAR FOR YOURSELF

Send in coupon NOW
for a free, on-the-job recording...
listen to the dramatic
difference in message clarity.

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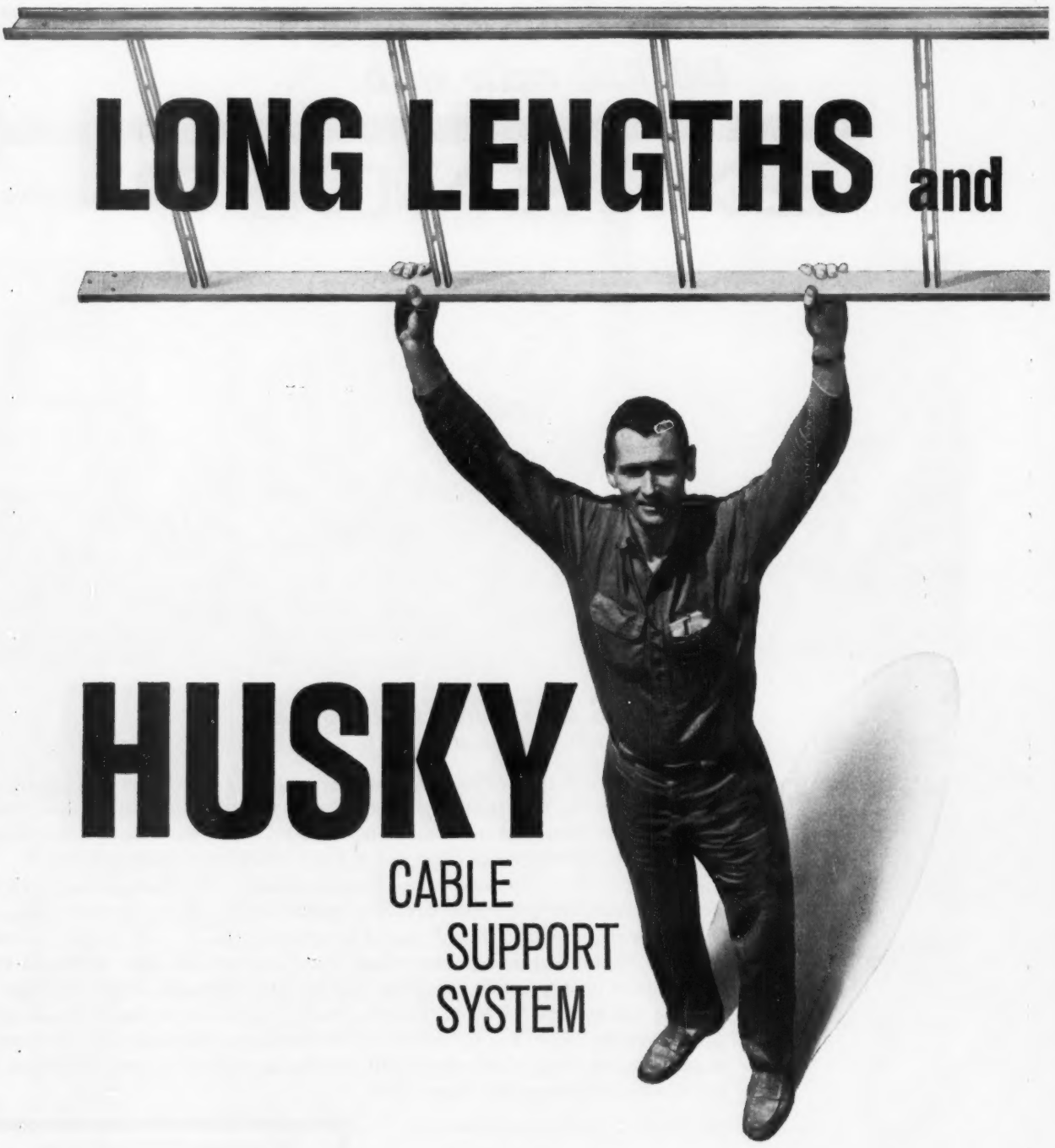
☐ Send me phonograph record
☐ Have salesman phone for appointment

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

MOTOROLA 2-WAY RADIO

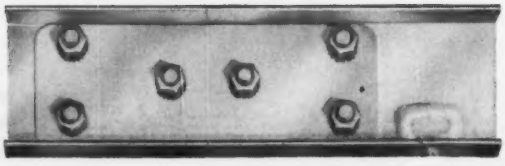
CIRCLE 83 ON READER SERVICE CARD

LONG LENGTHS and



HUSKY

CABLE SUPPORT SYSTEM

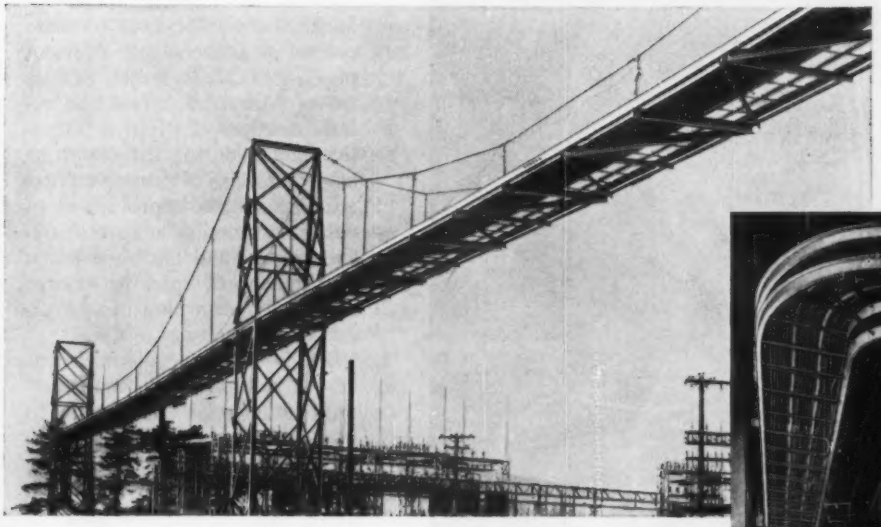


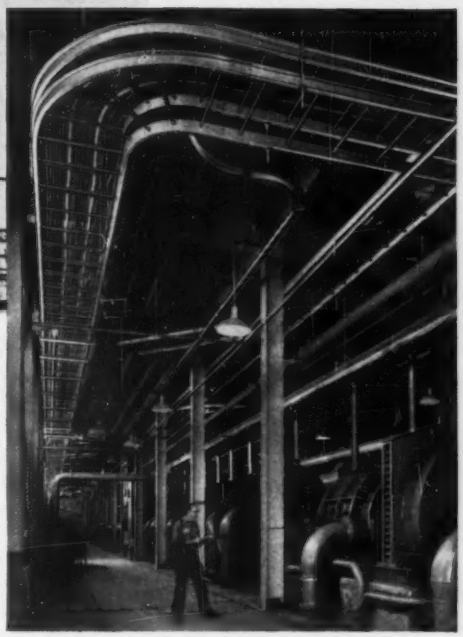
ELECTRICAL CONTINUITY. Faults grounded safely thru low-resistance rung and splice joints.

Send for electrical continuity data.

LONG SPANS...

...provide LOWEST INSTALLED COST with this maintenance-free aluminum cable support system.





LONGER LENGTHS. HUSKY'S 24-foot aluminum sections—replacing 12-foot steel sections—mean half as many units to handle, half as many splices to make. Yet a HUSKY section is easier to handle than a steel section half the length!

LONGER SPANS. Design with high-strength 6063-T6 aluminum alloys permits longer spans, intermediate supports and support installation labor reduced by 50% or more.

MAINTENANCE-FREE. Use of aluminum alloy permits maintenance-free installation under practically all atmospheric conditions.

SINGLE SOURCE. All cable carriers, support hardware, cable clamping devices, installation tools—even structural towers and bridges—from one source of supply with unit responsibility.

ENGINEERING SERVICE. Complete engineering services available for take-offs, mark-up of your drawings, or installation layouts.

HUSKY PRODUCTS, INC. — division of **BURNDY** CORPORATION

5300 Vine Street, Cincinnati 17, Ohio

61-20

CIRCLE 85 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

E u m

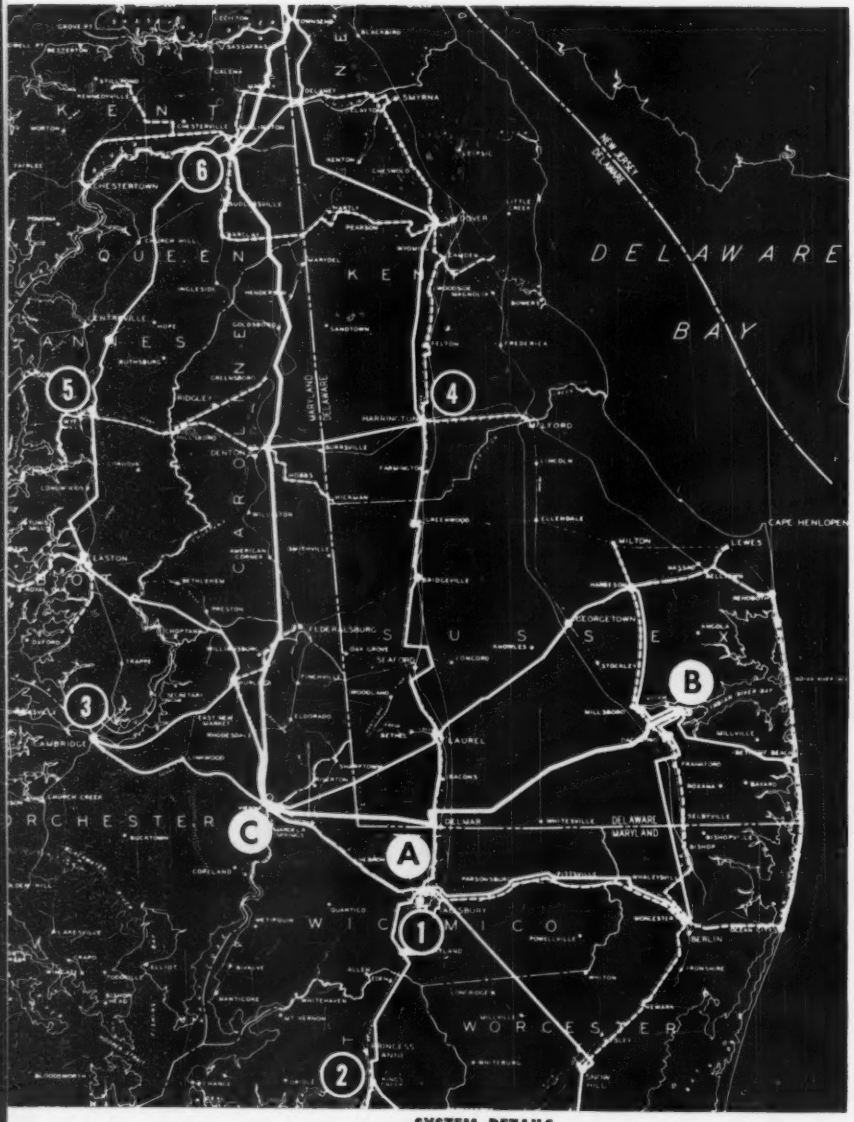
FEATURE SECTION

SYSTEM OPERATOR in Salisbury "dials" a capacitor through encoder which feeds signal to transmitter . . .

Coded Radio Switches Capacitors to

J. EDWIN HOBBS, Supervisor of System Operations, and

C. L. GILLIS, Communications Engineer, Eastern Shore Public Service Co of Maryland, Salisbury, Md.



SYSTEM DETAILS

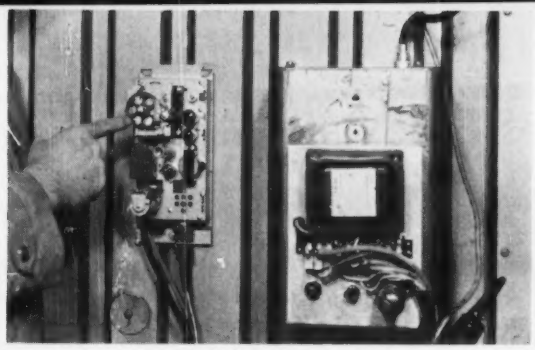
1 Two Capacitors (4.2 MVAR each)
2 One Capacitor (3.0 MVAR)
3 Two Capacitors (2.1 MVAR, each)
4 One Capacitor (4.8 MVAR)
5 One Capacitor (2.4 MVAR)
6 One Capacitor (2.4 MVAR)
7 One Capacitor (1.8 MVAR) (Off map)
A System Operations Office
B Indian River—180 Mw (2-Units)
C Vienna Plant—100 Mw (7-Units)

Switching of ten capacitor banks at seven locations by radio control gives the system operator of Eastern Shore Public Service Co of Maryland a fast and reliable method of supplying reactive power during the exporting of power. Use of remote control also has led to improvement of voltage regulation at several 69-kv stations, and has shown that the amount of spinning reserve for system protection can be reduced in some cases.

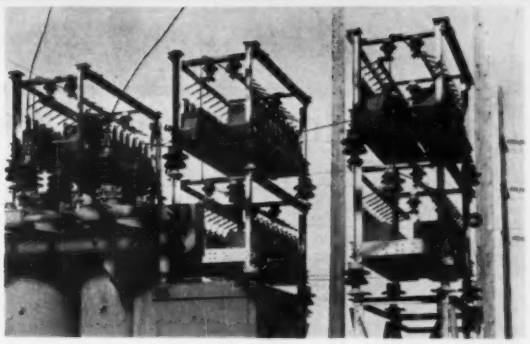
Radio-control equipment was devised and modified from standard commercial equipment to meet the problem of satisfying the var requirement of exporting up to 75 Mw over about 140 miles of 138-kv lines and its parallel 69-kv circuits.

Variations in export power over Eastern Shore's long lines imposed a voltage-regulation problem near the center of the transmission system. Internal reactive generation needed for maximum export has been as high as 40 kvar above the vars required to carry only the system load. In addition, system generation is at full kw capacity at the time of maximum export, thus limiting the var capability.

Supplying system reactive was originally achieved through the use of 23 Mvar of switched capacitors, installed at seven unattended locations to meet a former deficiency in generation. These capacitors were controlled



TRANSMITTED CODED SIGNAL is picked up by radio receiver, translated by decoder, and fed to the selector . . .



SELECTOR establishes required stepping relay action to achieve proper switching of the station's capacitor banks

Control System Reactive

by undervoltage relays to permit import of power upon the loss of a large generating unit. To meet the export requirement, they were being switched manually by trouble and service men on radio call from the system operator. This procedure however, was not entirely satisfactory to meet system operating requirements. In addition, it put more work on busy men and incurred extra charges when used after normal working hours.

Radio technicians of Eastern Shore Public Service came up with an adaption of available obsolete radio equipment that would allow the system operator to control the capacitor banks.

Each remote control unit consists of a surplus 6-v mobile receiver and a four-function SECODE decoder. The 6-v dc power supplies on the receivers were converted to 120-v ac operation at small expense, with each power supply built heavy enough to supply the decoder unit as well. The RPD-634 decoder contains a 49 HS-1 selector which is the heart of the system. Each decoder is capable of responding to four codes of five digits each. Thus, at stations where two capacitor banks are located, the decoder can be set to open or close either bank according to one of four codes. A sample set of coded addresses could be:

STATION NO. 1

Code	Breaker	Action
88462	1	Close
88464	1	Open
88466	2	Close
88468	2	Open

With only one capacitor bank at the station, one "open" and one "close" code is used and the other codes are available for future use. Each selector can be set to stay "in step" with a particular code. When the last digit in the proper code is received, the selector will close on a contact pin, thereby initiating the correct operation. Each decoder requires 200-v dc B+ 6-v filament voltage and 120-v ac.

The system operator can reach any of the seven remote stations through a TGS—720 code sender, or encoder, which feeds a signal to any of three 250-w 48.30-mc transmitter so located to give complete coverage of the system area. The encoder is essentially a free-running multivibrator with a tuned plate circuit operating at standard frequencies of 1,500 or 2,805 cps.

The latter frequency was selected because there is less chance of having this frequency pulsed by voice modulation. A 2,805-cps tone generator was added to the radio rack. The equipment is designed with a 600-ohm balanced output for use with carrier or microwave. The power supply is a conventional full-wave rectifier and filter network. The tone relay offers an extra set of dry contacts which are used to mute the microphone while the code is being dialed.

The system operator has a telephone-type dial installed on his desk. To call for a capacitor operation, he selects and keys the proper transmitter and initiates dialing of the code. With the first pull of the dial, the carrier is modulated by the tone. As the dial is released, the tone is "chopped" by the dial returning to rest. The break in the tone actuates the stepping relay in the decoding unit.

There is no check-back feature provided in this system. However, by observing telemetered voltage and vars from several points, the system operator can tell whether the bank has operated in response to his call. If a bank fails to operate, he can repeat without hazard.

Whip antennas were installed initially at all decoder locations, but they were not successful at the more distant substations where voice communications varied. The whips were replaced with coaxial antennas mounted on the 35-ft steel structures. A speaker was installed on the receivers so that anyone in the substation could monitor our system traffic.

In addition to giving the system operator a faster method of controlling vars, the remote radio control has brought an improvement in voltage regulation of the Salisbury 69-kv bus. Prior to the use of the equipment, voltage variations of 3% were not uncommon. Now the largest capacitors bring a voltage change of about 0.5%. Spinning reserve requirements for area protection, as determined by board studies and based on kvar and kw generation, also can be reduced. The quick availability of the capacitor banks already has released one 8-Mw machine from the requirement for a 3-week period.

CIRCLE 21 ON READER SERVICE CARD

Medical Instrument Automates Feedwater Analyses

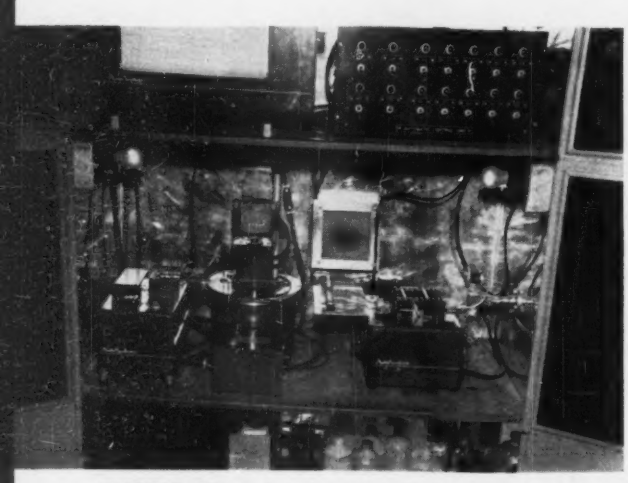
W. NACOVSKY, Division Chemist, Production Dept, Consolidated Edison Co of New York, Inc, New York, N. Y.

An instrument, originally developed for use in the medical laboratory, has been applied at several Consolidated Edison Co of New York, Inc, installations for the continuous and automatic analysis of high-temperature boiler water.

Con Edison's problem is concerned with concentrations of chemicals in parts per billion (ppb), or 0.0000001%. Accordingly, automation for greater sensitivity and for the elimination of error is highly desirable. Furthermore, where 350 Mw, or more, may hang on the successful operation of a single boiler, the need for frequent sampling and testing of the water is apparent. But manual analysis is difficult in cases where there is a complete change of water every ten min or less. Hence the further need for automation. Of course, automation is even more important in a nuclear station, such as Con Edison's Indian Point Station, because in such a plant, the feed water must be maintained at a relatively exceptional purity level at all times.

Development of a recording flame photometer fulfilled one requirement for automation. But further investigation of several automatic analyzing colorimeters disclosed the potential usefulness of the Auto-Analyzer, developed by the Technican Instrument Corp for clinical work.

The instrument consists of an assembly of modules. This assembly may be readily modified for a particular test. Among basic components are a proportioning pump capable of handling up to eight increments of sample and reagents, adjusted to predetermined ratios for optimum chemical reaction. Sample and reagents are pumped through mixing coils, time-delay coils, and heating baths in various configurations dictated by the test. Upon completion of the chemical reaction time, the mixture is passed into the flow cell in the colorimeter. The colorimeter's response is registered on a recorder.



FILTERED AIR cools cabinet-installed autoanalyzer; filter in water sampling lines removes most suspended solids

When a test operator has integrated the components of the equipment for a specific test, he needs only to supply the samples and the reagents in the correct ratio by means of the proportioning pump. The equipment is self-cleansing, the time of reaction is fixed, and the temperature is thermostatically controlled. The time delay to obtain a response to a specific sample normally is of the order of 5 to 10 min.

Con Edison's Chemical Engineering Bureau has adapted the Auto-Analyzer to power plant use. A closed cabinet was constructed, equipped with a blower and filter to provide clean air for cooling the instrument. Electronic devices were installed to stop the pump automatically in the event of a break in the tubing connections. A flow cell was developed to minimize time lag of samples to the instrument. A filter was installed in the water-sampling lines to remove suspended solids.

In using the adapted instrument, Con Edison determined that results can be obtained rapidly and automatically, with a minimum of manipulations, and these results are substantially devoid of errors which are normally incidental to handling of colorimeter tests.

A multipoint sampling device has been in operation about three years at Waterside Station for monitoring the phosphate content of boiler water in the ten high-pressure boilers. Samples from this device are admitted sequentially by means of a timing mechanism to the automatic analyzer at hourly intervals. Demineralized water separates the samples. In this manner, the results are recorded as a series of bars, the demineralized water samples registering the correctness of the zero setting. The recorder is equipped with a numeral stamping arrangement for identification of the boiler water samples.

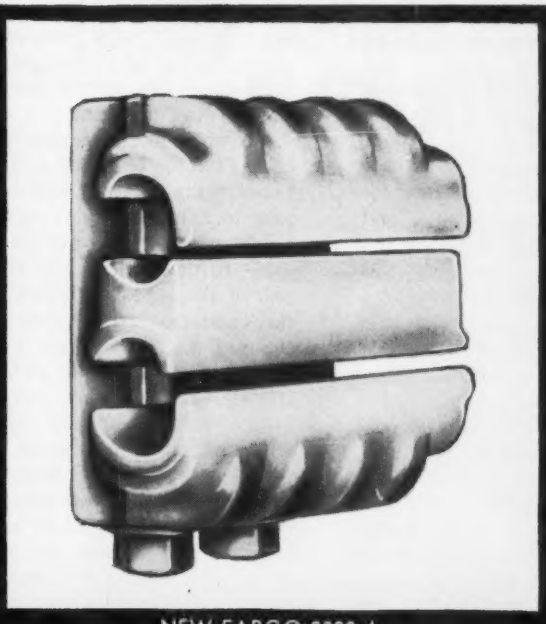
An automatic analyzer, coupled with a PH recorder, has been installed at the East River Station on Boiler No. 70 to evaluate the coordinated phosphate-hydroxide method of boiler water control.

The instrument has been used extensively in laboratory investigations of characteristics of resin for water conditioning. These tests involve the flow of fluids through columns of resins over extended periods and seek to ascertain the break-through of the contaminant in the water. Formerly, repetitive manual testing was required—the work being normally conducted during the regular day shift on a five-day basis. The analyzer makes it possible to operate continuously on a 24-hr, seven-day-week basis.

Another interesting application of the Auto-Analyzer projects would be the integration of this instrument with the control board of a demineralization plant. The impulse denoting break-through of silica would automatically start the regeneration of the resins. Such installations are projected for the 74th St and Waterside Stations.

CIRCLE 22 ON READER SERVICE CARD

Even Hot...



NEW FARGO 9800-A

"9000 Series" ALUMINUM CONNECTORS

Increased contact areas, larger radiating surfaces, and like metal contact minimize cold flow of the aluminum by reducing the pressure per unit area, by lowering the overall temperature rise of the conductor and connector at the points of contact, and by eliminating the difference in co-efficients of thermal expansion between the metals. Pressure is exerted on all of the strands thereby evenly distributing the current through the conductor. The increased length of conductor contact, also, helps overcome the high contact resistance of aluminum.

The spacer is soft, "pure" aluminum which provides a short, high conductivity path between conductors and forms around the strands sealing out corrosive media from the contact surfaces.

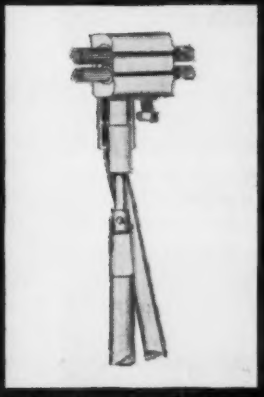
The one piece construction of the Fargo "9000 Series" greatly simplifies installations as there are no loose parts to handle. The long protected thread engagement eliminates thread galling or seizing due to over stressing or corrosion thereby assuring easy removal.

It is unnecessary to change sockets when installing two bolt connectors in sizes from #2 to #666, 600 ACSR for aluminum to aluminum or aluminum to copper connections.

FARGO
TWO BOLT CONNECTORS
ARE EASY TO INSTALL

1. Place clamp in two bolt hot line tool tightening on positive grip, wedge shaped boss.
2. Position spacer for easy tap insertion.
3. Hook over run.
4. Insert tap.
5. Tighten bolts by swiveling wrench socket from one to the other.

Result: Simple hot stick installation on large size conductors giving an excellent, low resistance connection.



Safety Live Line Tool #722

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
In Canada, CLM INDUSTRIES, Toronto 13, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

Trolley-Magnet Locates ACSR-Joint Steel Sleeve

MORLYN U. DOWELL, Electrical Engineer Central Power & Light Co, Corpus Christi, Tex.

RALPH M. HUSTON, Field Service Advisor, Rome Cable Div, Aluminum Co of America, Dallas, Tex.

A unique and inexpensive trolley-magnet which locates with precision the position of the steel sleeve in an ACSR compression joint—safely even on energized lines at almost any voltage—now is being used effectively at Central Power & Light Co, Corpus Christi, Tex. The device located two such joints out of more than five hundred examined with its aid. Upon cutting open sleeves which had been checked and marked to verify the location, it was found that steel sleeves may be located within an inch of their true position quickly and easily at normal conductor heights.

When an ACSR line fails, and an improperly installed joint between the aluminum sleeve and the conductor is suspected, a quick means of determining the position of the joint's steel sleeve is a must.

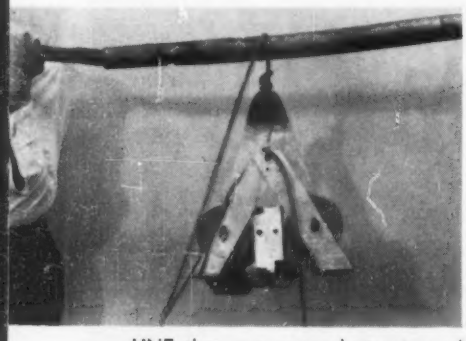
Various methods of testing for "hot" splices were considered, but existing normal load currents were not sufficient to keep a defective joint hot over any appreciable length of time. Methods for measuring joint resistance were considered, but no practical way to do this was devised. A satisfactory solution was found in the steel-sleeve locator.

The instrument consists of a small aluminum dolly carrying a strong permanent magnet, suspended by springs or rubber bands. As the dolly is rolled over a splice, the magnet, adjusted so as to be held up by the spring tension, is attracted to the steel core of the cable. When the magnet passes over the end of the steel-core splice, it immediately drops down, making contact with the bottom of the dolly, thus closing an electrical circuit to a flash bulb and battery. The bulb continues to burn until the magnet is moved beyond the end of the steel splice, at which time the magnet is lifted by the springs and turns the light off. A working model of a smaller hand instrument, about the size of a flashlight, was also made for use in checking sleeves on the ground.

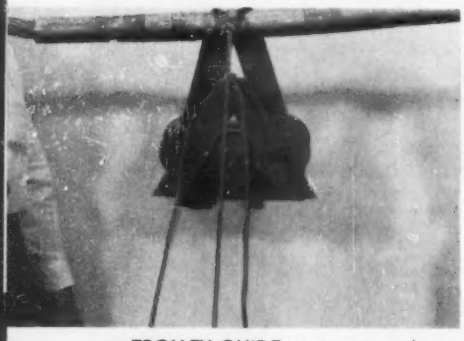
To position the trolley on a conductor for checking a sleeve, two lengths of rope, sufficiently long to extend to the conductor height are attached—one on each side—to the trolley. The end of one of the ropes is thrown over the conductor and worked over the sleeve. The trolley instrument is then pulled up and over the sleeve. The other rope, attached to the opposite side, is used to keep the instrument from going too far when it flops over the sleeve. These two ropes are then used to pull the dolly slowly back and forth over the sleeve in order to locate the steel-core splice inside the aluminum sleeve.

Binoculars are used to watch the light, and also to get a better view of the magnet over the sleeve. When the check has been completed, the ropes are slacked off to allow the dolly to fall off the sleeve and to be lowered to the ground.

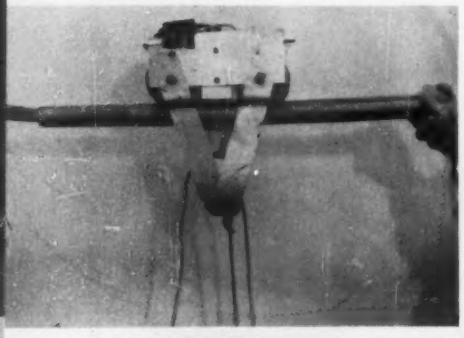
Springs and wheel adjustments for any wire size or sleeve type have proved to be simple to make, provided a sample of the sleeve to be tested is available; otherwise, a slightly longer trial-and-error method may be used. The instruments as constructed were fairly rugged, and subsequent adjustments seldom proved necessary.



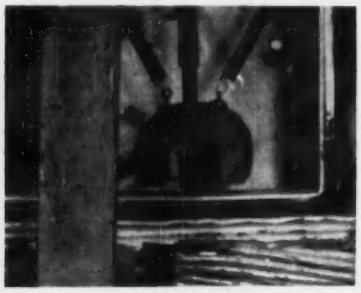
LINE, thrown over conductor, is used to haul trolley up to an ACSR joint



TROLLEY GUIDE seats on conductor as hauling on the line is continued



CONTINUED PULL on line flops trolley to position astride conductor



MAGNET drops to joint just above steel sleeve; rises after passing sleeve

ANY MAN CAN WEED-PROOF 10,000 SQUARE FEET IN TEN MINUTES...with UREABOR®31

Get lasting protection from weeds and grasses this easy low-cost way

A SPECIAL SPREADER simplifies and speeds the UREABOR 31 applications at low rates with accuracy. Spreader holds enough UREABOR 31 to treat 1250 sq. ft. without refilling; weighs a mere 6 lbs. Width of the swath can be adjusted.

STANDARD PACKAGE IS 50 LBS. UREABOR 31 is packed in multiwall paper sacks for easy handling—easy storing. A convenient package, easily disposable, for spotting at predetermined intervals to facilitate large-area applications.

UREABOR 31 IS 3 HERBICIDES IN 1 The plant-destroying powers of 3 proven herbicides are combined in this granular mixture of sodium borates, substituted urea, and trichlorobenzoic acid to yield fast, long-lasting, nonselective results.

UREABOR 31 is a special weed killer for industrial grounds. It lowers maintenance costs... protects property... and improves appearance. UREABOR 31 is effective on a greater variety of weeds and grasses than any other herbicide now on the market. A single dry application gives year-long control! Yet it takes only 1 to 2-lbs. per 100 sq. ft. to do the job! As a granular material, UREABOR 31 is always ready to use... and safe to handle. It's a big time saver too... any man can easily weed-proof ground at the rate of 1,000 square feet per minute.

Write for literature now!

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CIRCLE 91 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

Eum

CONSTRUCTION

Aerial 'Drop-Scoop' Saves Time and Money

Pouring concrete foundations with the aid of a helicopter saved Southern California Edison Co five days' construction time and cut costs by about 39% in erecting three 50-ft-high, 66-kv transmission towers in a remote, inaccessible area.

The project called for putting up three single-circuit, steel towers at North American Aviation Rocketdyne Division's Propulsion Field Laboratory, near Chatsworth, in the San Fernando Valley. Two were to be 1,900-lb suspension towers, the third, a 3,200-lb anchor tower. Suspension tower foundations required 5½ cu yds of concrete each. Anchor tower foundation took 8 cu yds.

But the tower locations were inaccessible to conventional transit-mix trucks and initially it seemed as if it would be necessary to transport foundation concrete manually by wheelbarrow —and, somehow, steel too. Then Edison decided to use its helicopter—a 310-hp Hiller 12-E.

The concrete operation was carried out by a "drop-scoop" method. One concrete-mixing truck at a time was brought to the helicopter loading area, about ¾ of a mile away from the tower sites—the closest the trucks could be driven in by road. When the truck arrived at the area, it dispensed the concrete into a concrete-carrying bucket. Especially designed for the job, the 4½-ft-long heavy canvas bucket had a steel top and bottom. The steel bottom was arranged with a trap door, opened by rope lanyard. Reinforcing steel cables provided a common ring at the top to which the helicopter could hook up.

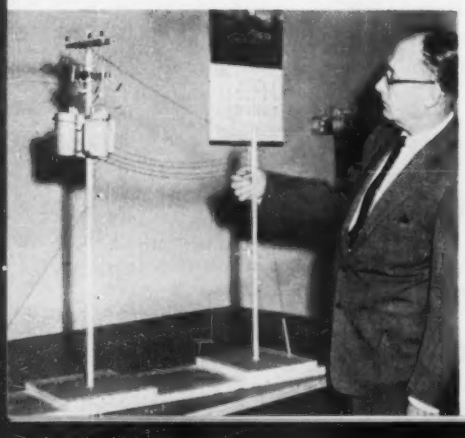
A four-wheeled cart, made up from 2x4-in. lumber, was used to manually move the concrete filled bucket to a safe point about 20 ft away—where the helicopter picked it up and flew it to the site.

Carrying a load of about 5 cu ft of concrete, the helicopter averaged 2 min per round-trip. It finished the concrete hauling job in only two days.

Southern California Edison's transmission division estimates that by pouring the concrete by air it saved 39% compared to what the cost of pouring otherwise would have been—resulting in an 18% overall saving on the footings. About five days' time was chopped from the concrete foundation job by this method.

CIRCLE 23 ON READER SERVICE CARD

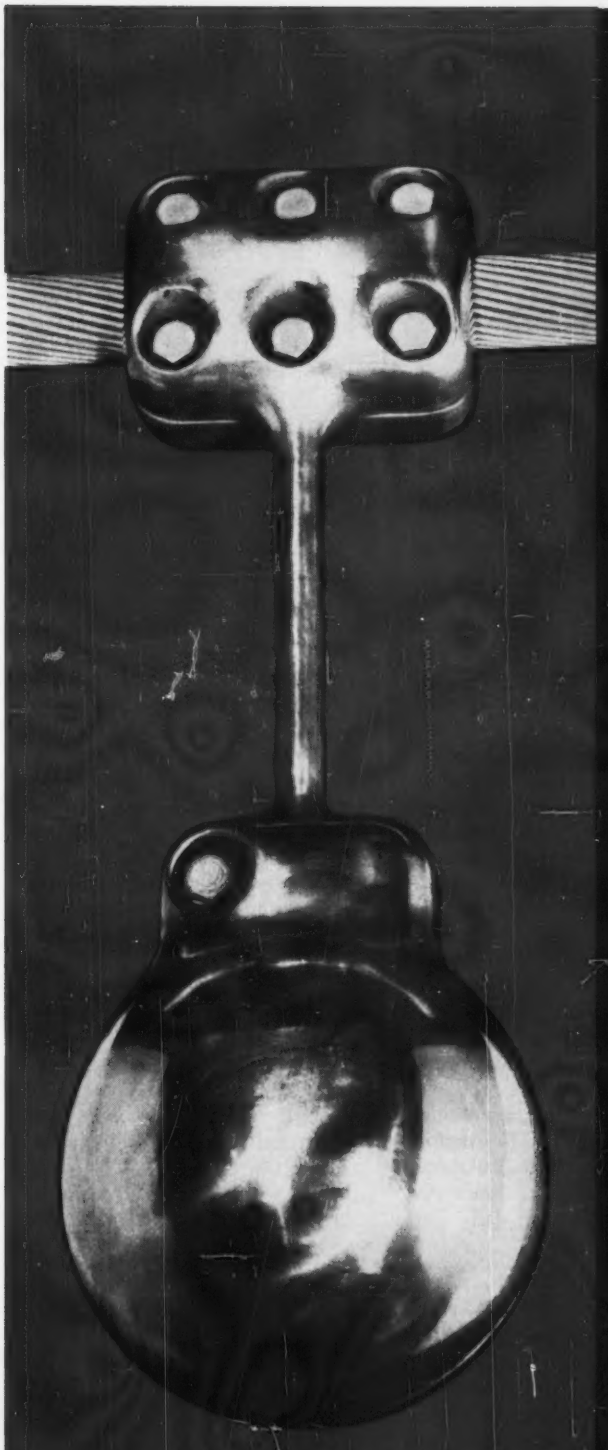
Pull Chains Realistically Simulate Conductor Sag



PULL CHAINS sag realistically and permit the measuring of clearances

Simulating sags of wires on models used in developing structure designs has always presented a problem—small conductor wire does not assume the same relative sag on models as the actual conductors take when they are put in service. To solve this problem, W. A. Gardner of Carolina Power & Light Co, hit upon the idea of using pull chains of the type used for turning lights on and off. Their flexibility and weight produce a realistic simulation of sags of conductors and guys so that clearness can be measured and design changes made as needed.

(More Construction on page 94)



NEW!

HIGH VOLTAGE CORONA FREE CONNECTORS

Another first from Anderson

Increasing use of high voltage in today's substations has created the need for a NEW line of connectors and bus supports. Anderson research has found the answer: a CORONA FREE LINE. How? By designing connectors and bus supports free of protrusions . . . with recessed bolts and no exposed threads . . . smooth flowing radii and large surface area. Tests have proved that these connectors and bus supports can be operated corona free on 345 KV_{LL} systems with less than 50 microvolts Radio Interference Voltage. Contact Anderson now for full details and test data.

ANDERSON ELECTRIC CORPORATION
BIRMINGHAM 1, ALABAMA

Research Quality Performance in Aluminum and Bronze Products

No more stopping to clear chips

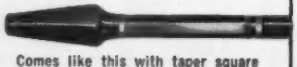
New Irwin Pole-Bor Bits save time . . . money

Now get easier, faster, non-stop boring action in telephone and power poles. Irwin Pole-Bor bits give continuous chip flow—even in creosoted wood. Special Irwin cutting head, twist angle, and smooth-polished hollows eliminate clogging and binding. Side lip smooths hole for easier insertion of bolts and pins. Heat tempering full length gives extra strength, more safety for the man on the pole.

3 Lengths — 12 Sizes

New Irwin Pole-Bor bits come in 12″, 18″ and 24″ lengths, with 8″, 12″ and 18″ twists. Sizes range from $^{9}/_{16}$″ to $^{17}/_{16}$″. Use these new Irwin bits for just about any job — whether boring crossarms, small, medium or extra large poles, heavy timbers. And remember: Irwin's patented Adapter Shank fits both hand braces and electric drills. Save time and money. Use fewer bits on the job. Get Irwin Pole-Bor non-stop boring action and extra safety, too. Order from your Irwin distributor today. The Irwin Auger Bit Company, Wilmington, Ohio.

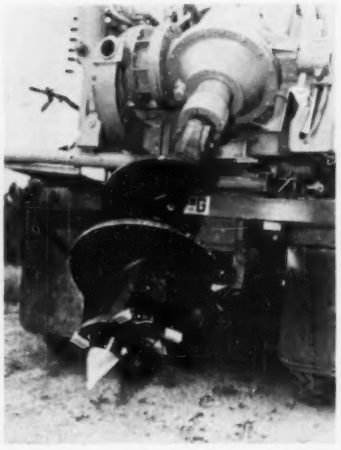
Irwin Adapter Shank fits both hand braces and electric drills



Comes like this with taper square shank for use in hand braces.

Cut off taper square shank. Use in both hand braces and electric drills. No wobble, no run-out.

IRWIN Pole-Bor Bits



'Poleborer' Eases Tough Pole-Hole Dig

Sullivan County Rural Electric Cooperative Inc, Forksville, Pa, is boring pole holes in "hard dig" ground with a hard penetrator point Poleborer, rather than manually—in one-eighth the time and at about one-half the cost.

The Sullivan County construction crews were forced to abandon standard drilling equipment when they found that they could not penetrate through various mixtures of gravel, hardpan, redrock, frost and granite lumps. It then took two men a minimum of 6 hr to shovel out a 5 to 7-ft hole in this rural area.

To resolve the "rough dig" problem encountered, Sullivan County REC tried, as a pilot operation, an Enterprise digger plus a Poleborer auger mounted on a Ford, Marmon-Herrington, all-wheel drive. The Poleborer is manufactured by Trainer Associates, New Castle, Del. This special auger, mounted on the rig described, provided efficient, fast-digging action through the roughest of ground—to the degree that a two-man construction crew was able to average a pole hole every 45 min. The auger, constructed of high-strength steel, was found to dig, and "carry off" in one operation. This action reportedly is achieved because of its hard penetrator point and single-flight teeth, strategically placed for graduated action to drill, bulldoze or breakup.

The Poleborer has been adopted by SCREC for continued use in their line project. The co-op estimates that the continued use of the auger will result in a significant time-savings, plus a reduction in labor and costs. The costs to dig each hole previously estimated at $20.00, is now set at $11.00.

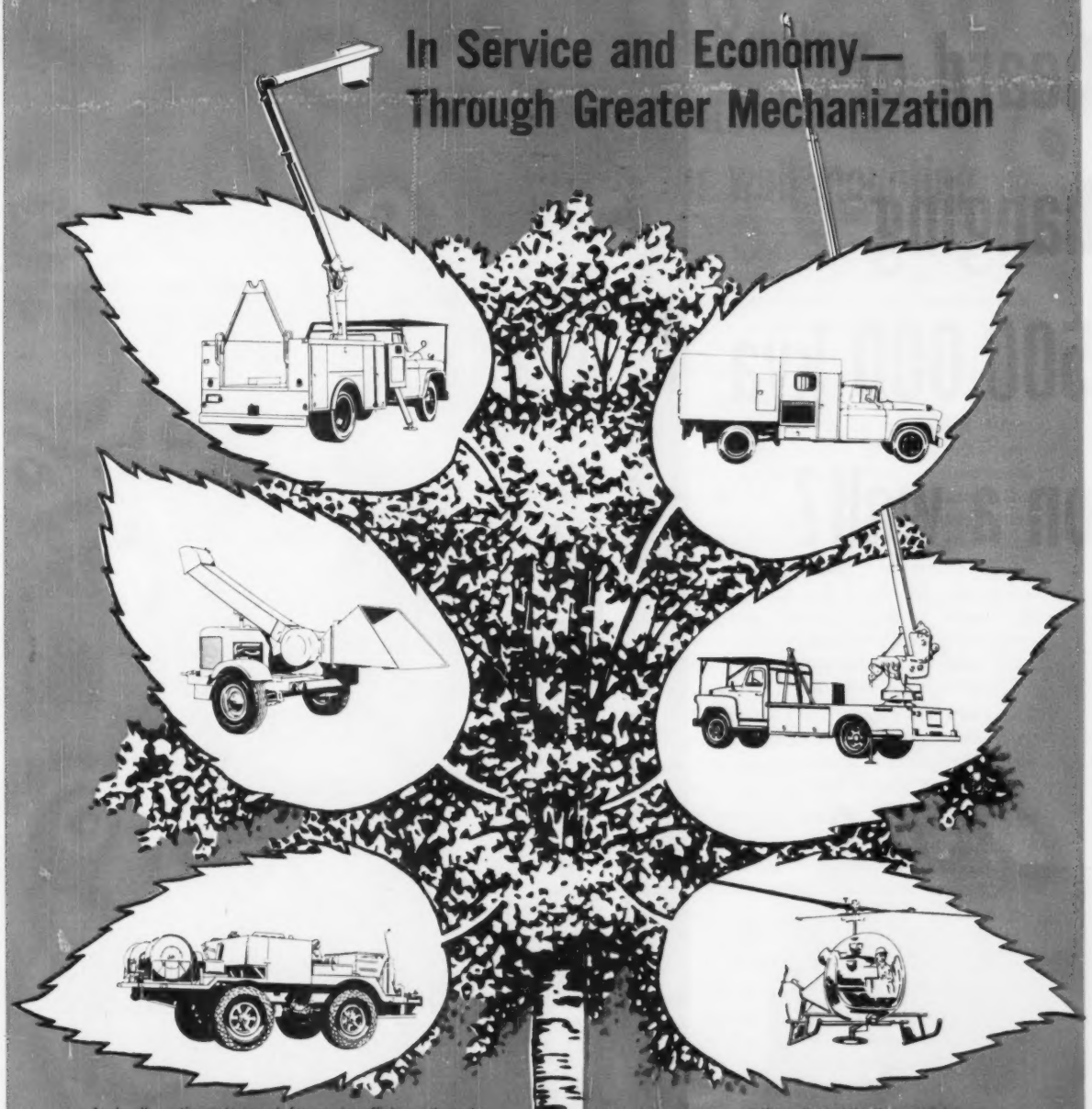
CIRCLE 24 ON READER SERVICE CARD

Curved Spillway Eliminates Erosion

At the new Gorge Dam of Seattle Dept of Lighting, on the Skagit River, a curve built into the spillway, near the gravity section of the dam, keeps the cascading water from eroding the river bank below the dam. The flow is "folded over" onto itself so that much of the force is dissipated before the water hits the rock-protected downstream bed of the river.

ASPLUNDH REACHES NEW HEIGHTS

In Service and Economy— Through Greater Mechanization



Asplundh continues to search for greater efficiency through modern equipment • The Asplundh organization, national in scope with experienced personnel and progressive management, is prepared to handle all phases of line clearing, chemical brush control and right-of-way clearing.

Let our representative, at no obligation, explain how your program can best be serviced with Asplundh manpower and specialized equipment.

OFFICES IN PRINCIPAL CITIES

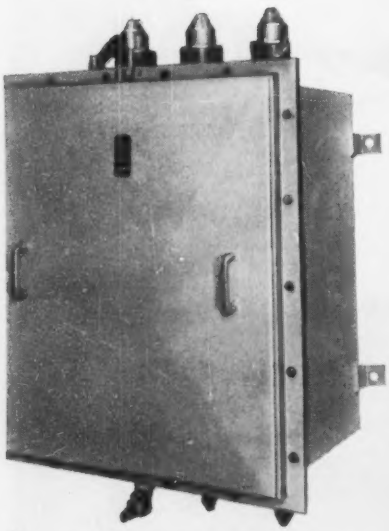
LEFT DOWN
Trim lift, trailer chipper, chemical spray truck

RIGHT DOWN
Truck chipper combination, tree topper, helicopter spray

ASPLUNDH TREE EXPERT COMPANY
505 York Rd., Jenkintown, Pa.

CIRCLE 95 ON READER SERVICE CARD

Who ever heard of hanging 500,000 kva on a wall?



▲
Submersible style for use in basements or vaults where flooding is a possibility.

▶
Indoor-outdoor style for general application where there is no possibility of flooding.

Do it with S&C's new line of high-voltage metalclad fuses for wall mounting

Here is a steel-enclosed fuse that gives you economical and fully adequate high-voltage fault protection for small loads:

1. *At service entrances;*
2. *On transformer primaries;*
3. *At underground sectionalizing points.*

S&C's new line of metalclad fuses combines economy with high fault interrupting capability. Their compactness permits wall mounting, eliminating the floor area requirements of conventional free standing metalclad switchgear. And much less room height is needed.

These fuses are especially suited to applications that justify fault protection *only*—applications where infrequent load switching (and isolation for rare fuse replacement) may be done elsewhere.

To permit you to tailor the new S&C Metalclad Fuse—Type SM to your particular requirements, a complete selection of features and ratings is available:

- Indoor Style, Indoor-Outdoor Style, or Submersible Style
- 4.8 kv or 14.4 kv
- 200E or 400E continuous amperes
- Cable entrance by knockout, flange-mounted pothead (1/C or 3/C), or integral pothead (1/C)
- 45,000 kva to 500,000 kva fault interrupting, in convenient steps

For further information, call your nearest S&C Sales Office. Consult the Yellow Pages under "Electrical Equipment" for the telephone number and address in all principal cities.

S&C ELECTRIC COMPANY

4421 Ravenswood Avenue • Chicago 40, Illinois

Specialists in High Voltage Circuit Interruption since 1911

S&C

CIRCLE 97 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

E u m

OPERATIONS & TESTING

Automated Bomb Calorimeter

J. W. MINDER, Asst Chemical Engineer, Power Production Div, and **W. F. BLOOM**, Test Engineer, Testing Section, Electrical Engineering Dept, Dayton Power & Light Co, Dayton, Ohio

Automation of an adiabatic bomb calorimeter has helped Dayton Power & Light Co to determine calorific values of fuels more quickly and accurately than formerly was possible. The following advantages have accrued:

- Automatic operation is more accurate than manual.
- Technicians are relieved of a tedious task and can devote up to 3 hr per day to other duties.
- Time required to make a determination has been reduced from 25 min to 12 min, permitting more determinations per calorimeter per day.
- Operation is simple and results are reproducible.
- No maintenance required during 6 months of operation.

In installation of the automatic feature, it was kept in mind that both the hot and cold water temperatures are important in sizing the orifices. The cold water temperature was 62F, while hot was 150F. An 0.065-in. orifice was installed in each line.

The orifice size is important, not only for the water temperature, but also to assure that orifices are small enough to prevent overflowing in the jacket when the solenoid valves used to control flow are in the full-open position. Orifice size is also important in eliminating hunting or overshooting, although this is primarily controlled electrically.

Two $\frac{5}{8}$-in. holes were drilled in the calorimeter lid, one as close to each thermometer as possible for insertion of sensors. Bushings were installed in the openings to prevent leakage. The sensors were attached to the supporting arm of the thermometer support to enable the sensors to be raised and lowered along with the thermometers. Solenoid valves were installed in both hot and cold-water lines.

Two thermistors are used as the temperature-sensing elements and are connected to form two arms of a resistance bridge. This bridge, energized by a low-voltage dc supply, is initially balanced by placing both sensors in the calorimeter jacket with the agitator running and operating the balancing control until the bridge output, E_1, is zero. This is indicated by a zero reading of a galvanometer on the control unit panel.

A Zener diode stabilized voltage source supplies a reference voltage, E_2, which can be made to vary in both polarity and magnitude. This voltage is zero when the controller is balanced.

The sum of E_1 and E_2 is fed

Indicators Aid Distribution Load Management

Three hundred signal light (TL) indicators for indicating the economic limit of loading conventional-type distribution transformers have been installed by the Philadelphia Electric Co on their 25, 37½, and 50-kva transformers in the utility's urban and suburban areas.

CURRENT heats bi-metallic helical to deflect arm and light neon lamp

To eliminate dropping load to any customers during installation of the TL indicators, a shunt path was provided on the secondary risers before disconnecting the two line leads. Then, it was only necessary to insert the line leads through the indicator case and connect the signal light leads at 120 v.

In operation, the flow of secondary current which passes through the indicator, if excessive, will heat a steel plate. This, in turn, causes a bi-metal helical to deflect, rotating an arm. If the overload exists long enough, the arm makes contact, completing the circuit and lighting a neon light.

The utility patrols its distribution lines equipped with TL indicator-type transformers. After a signal light indication, the indicator is reset and the installation is marked for further checking and possible changeout to a larger rating.

The significant advantage of the TL indicators, supplied by Westinghouse Electric Corp, as a load-monitoring device is that they can be applied selectively across an entire system with a minimum of time, cost and inconvenience to keep capital investment, operating cost and revenue losses to a minimum. Ninety percent of the indicators used are applied to 10 through 50-kva pole-type distribution transformers for determining load limits economically, accurately, rapidly.

CIRCLE 26 ON READER SERVICE CARD

Speeds Measurements

into a high-gain amplifier, which drives a servo motor to position an output shaft. With the sensors in normal operating positions, any difference in temperature between the water in the bucket and the jacket will produce a voltage at the bridge output and, consequently, at the amplifier input. This results in a movement of the servo-driven output shaft which operates a potentiometer to adjust the reference voltage, E_2, to a value equal, and opposite in polarity, to E_1. Hence, positioning of the output shaft is at all times dependent on the temperature difference seen by the sensors.

Operation of contacts controlling hot and cold-water valves is controlled by output shaft position. When a temperature difference exists, the proper valve will be actuated every 2.5 sec for an interval of time proportional to the temperature differences. At zero difference, no valve operation will occur.

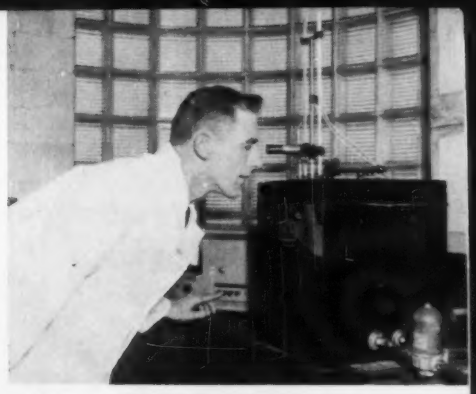
Features added for the operator's conveniences include a zero center galvanometer with expanded scale to indicate shaft position (zero indicates temperature balance) and a signal to alert the operator after balance has been obtained for about 30 sec. A push-button switch permits rapid selection of mode of operation required, with a manual control available for calibrating the instrument when necessary.

Operation of the calorimeter is essentially the same as that when manually operated, until the sensors are lowered into the water. Automatic controls then take over and adjust the outer jacket water to correspond with the bucket water (± 0.10F). Initial stabilization is admitted through the solenoids to maintain constant temperature between the two jackets. Final stabilization is normally reached within 11-13 min after the sensors are lowered into the jackets.

After the bucket is removed from the calorimeter, the controller is set at the "purge" position. This permits a continuous flow of cold water to reduce outer jacket temperature, preparing for the next determination. The purging time depends on the temperature of the bucket water used for the next determination. In operation, an operator only has to read initial temperature, fire the bomb, and read final temperature.

Standardization tests run by two different operators have revealed the bomb equivalents determined by this method are practically the same as they were before the automatic feature was added.

CIRCLE 25 ON READER SERVICE CARD



CONTROL UNIT, at technician's fingertip, adjusts temperature of water

Wire Mesh Cloth Guards Wood Poles

A woven steel wire mesh is helping to solve a "bird" problem for a number of electrical utilities and gives promise of saving sizable sums in replacement costs of wood poles.

Called industrial wire cloth, the mesh has been wrapped around poles in wooded areas in the South and other sections to combat forays by woodpeckers which for years have played havoc with utility poles. Often, the razor-billed birds begin their assault on the poles even before construction crews leave the job. In heavily-forested regions, poles with a normal life expectancy of 30 to 35 years have required replacing after only a few years of service.

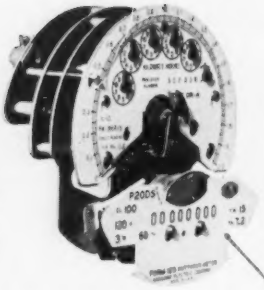
Various other methods have been employed in an effort to check the problem. The old poles have been left standing to occupy the woodpeckers, yet they quickly move to the new ones. Even the placement of metal snakes on the poles have failed to intimidate them.

In applying the ½-in., 19-gage wire mesh, heavily galvanized cloth, poles are completely covered from the top to a point 12 ft above the ground. The wire is overlapped 2 in. horizontally and vertically. Installation is horizontal, since pole taper and wire stiffness make vertical installation more difficult. Pole tops are capped, and wire is notched around the arms.

CIRCLE 27 ON READER SERVICE CARD

(More Operation on page 102)

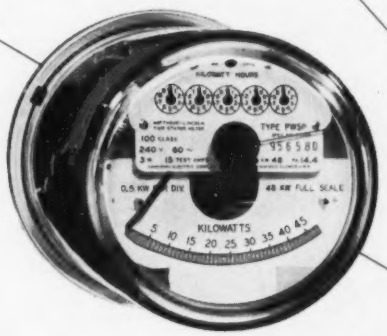
'FOR THE BIRDS', explains a lineman to two inquisitive youngsters



DR (dual range) mechanical demand registers reduce register change-outs, cut inventory costs, let you double the demand range as the load grows.

Sangamo's P20 and P30 are the most modern and advanced two and three stator meters. They provide the highly sustained accuracy needed to better measure today's large loads.

NEW VALUES IN POLYPHASE METERING



PW (combination kwh/thermal kw demand meters) have dual range designed to keep abreast of your growing loads.

Universal metering equipment with the P60S universal meter and UM meter mounts (UM-1 with CT's and PT's—UM-2 for external transformers) attain real savings through standardized metering on all conventional services.

Sangamo Autopass metering equipment provides positive secondary circuit opening and closing on transformer-rated installations. It combines "C" base 2 and 3 stator Class 10 meters with the UM-2 meter mount.

Take a look at what's new in polyphase metering—the most complete, most advanced line of meters and associated equipment! Developed by Sangamo to meet your current needs and to anticipate your future requirements.

P40 meters measure kvar hours and P50 meters measure kva hours without the use of external phase-shifting transformers. Both can be equipped with mechanical demand registers.

All of these two and three stator meters have *true magnetic flotation* . . . the moving system that floats freely and permanently on a magnetic field created by specially bonded Alnico magnets. All retain the proven Sangamo advantages of slow speed and high torque to give you polyphase meters with unexcelled sustained accuracy. All are small and compact—the P30, for example, is the lightest, smallest three stator meter . . . the only one with single disk, round cover design. All feature sectionalized construction, interchangeable components, and easy-to-use adjustments.

Dual range mechanical demand registers are available for every type, and most thermal demand meters feature dual range. On Sangamo demand meters, you can double the range with a screwdriver, quickly and easily—no recalibration is necessary.

Entirely new metering concepts offer many unique benefits. Investigate Sangamo's universal meter and meter mounts. Consider Autopass equipment for your polyphase transformer-rated installations • • •

LOOK TO SANGAMO FIRST for all of your polyphase metering needs

When you need polyphase meters, remember the outstanding values that are yours when you specify Sangamo. Remember also that this is *the most complete line* of kwh, kvarhr and kvahr self-contained and transformer-rated meters, in both socket and bottom-connected construction, with dual range mechanical and thermal demand.

Your Sangamo Representative can give you the complete story on these new developments.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

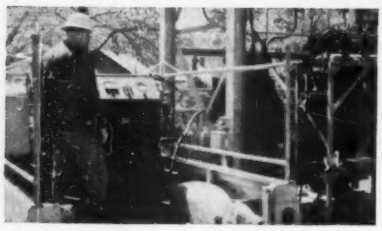
PW61-7

THE ELECTRICAL TESTER by MULTI-AMP®

MULTI-AMP TEST SYSTEMS

PROVIDE CONTINUOUS POWER FOR CONTINUOUS PRODUCTION

MULTI-AMP Div. MULTI-AMP Electronic Corp.



OIL CIRCUIT RECLOSER TESTING AT WESTERN MASS. ELECTRIC

Accurate, fast and safe testing with a portable high-current test unit is the approved method for checking electrical and operating characteristics of oil circuit reclosers at Western Massachusetts Electric Company. Old-fashioned battery and fault-staging methods have given way to using a MULTI-AMP test set. Operation of this single-unit, up-to-date method, and other interesting facts about taking the guess work out of oil circuit recloser testing are reported in a recent article by Roy F. Webler, supervisor of stations.

Western Mass has approximately 95 three-phase type reclosers on distribution lines and in substations, plus 170 single-phase reclosers of the hold-closed type. Thanks to the simplicity of the MULTI-AMP portable testing device it is now standard practice to conduct extensive electrical and operating acceptance checks on all new reclosers before field installations. Field maintenance checks are also accomplished periodically with this portable tester.

For the full story write for Bulletin R-60, "Guess Work Taken out of Oil Circuit Recloser Testing".

M 104

Free copy on request. Call or write MULTI-AMP Division, MULTI-AMP ELECTRONIC CORP., 465 H Lehigh Avenue, Union, N. J. — MU 8-7112

Ice Pipe Cools Coal

A drilled pipe, filled with dry ice, was recently driven into a coal pile at Dow Corning Corp, Midland, Mich., to achieve a unique means for controlling and minimizing hot spots resulting from spontaneous combustion.

In most large coal-storage areas, fire from spontaneous combustion is a constant threat involving loss of much coal, plus the discomfort and hazards such fires create. Recently, L. L. Moran, A. Meyers and J. Panghorn, all of the power supervision dept of Dow Corning, came up with an economical and easily-achieved solution.

First, a section of 3-in.-dia pipe was slit at one end and wedges were cut to form a sharp coal-penetrator point. The other end of the pipe was threaded and holes were then drilled along the pipe length. Next, the pipe section was filled with dry ice, and after a cap was screwed on the end, the pipe was driven into the coal in the vicinity of the hot area. Actually, the pipe can be made up to penetrate to any depth desired by coupling additional sections as each section is driven down.

The dry ice delivers a one-two punch. First, it cools the coal in the immediate vicinity of the pipe section. Then, as the dry ice goes off in a gas, the fumes filter through the coal, forming a blanket of CO_2 to smother the remaining fire.

FOUND!

How To Keep Street Lights Burning

Take a simple, lightweight, compact photo control. Use Varistors in conjunction with the secondary lightning arrester.

RESULT: You eliminate the one biggest cause of photo control failure... transient voltage surges which are *below* the spark-over of lightning arresters.

That's LUMATROL MARK I...completely reliable! It withstands ALL transients up through the capability of the secondary arrester!

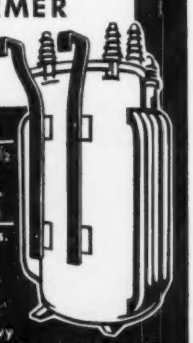
WRITE FOR BULLETIN 91a.

MICRO BALANCING, INC.
GARDEN CITY PARK, N.Y.

In Canada: J. R. KEARNEY CORP.
Box 270, Guelph, Ont.

CIRCLE 126 ON READER SERVICE CARD

THIEL
TRANSFORMER HANGERS



MODEL	C-1	C-3
Transformer	75-100 KVA Single-Phase	75-112½ KVA Three-Phase
Weight	46 lbs.	100 lbs.

Thiel Hangers are made to NEMA specifications. Heavy gauge steel construction, hot-dip galvanized for dependable service and long life. Two styles complete with galvanized bolts and nuts stocked for immediate shipment.

HANGER KICKERS Sizes to fit T-Type hangers.

T-TYPE HANGERS Two sizes, for 3-50 KVA 1-Phase and 9-45 KVA 3-Phase transformers.

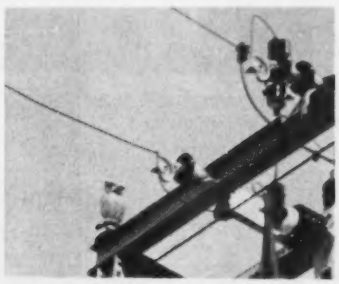
THIEL TOOL & ENGINEERING CO., INC.
1417 N. MARKET ST. LOUIS 6, MO

CIRCLE 127 ON READER SERVICE CARD

Hoists Aids Nitrogen Cylinder Handling

Hoists have been installed at unattended substations of New Orleans Public Service, Inc, to facilitate the handling of nitrogen cylinders. Brackets for the hoist rigging were fabricated in the utility's shops.

The arrangement permits one man to remove an empty cylinder and install another in the nitrogen-cylinder cabinet with complete safety. Formerly, the job was "man-handled," with no rigging.



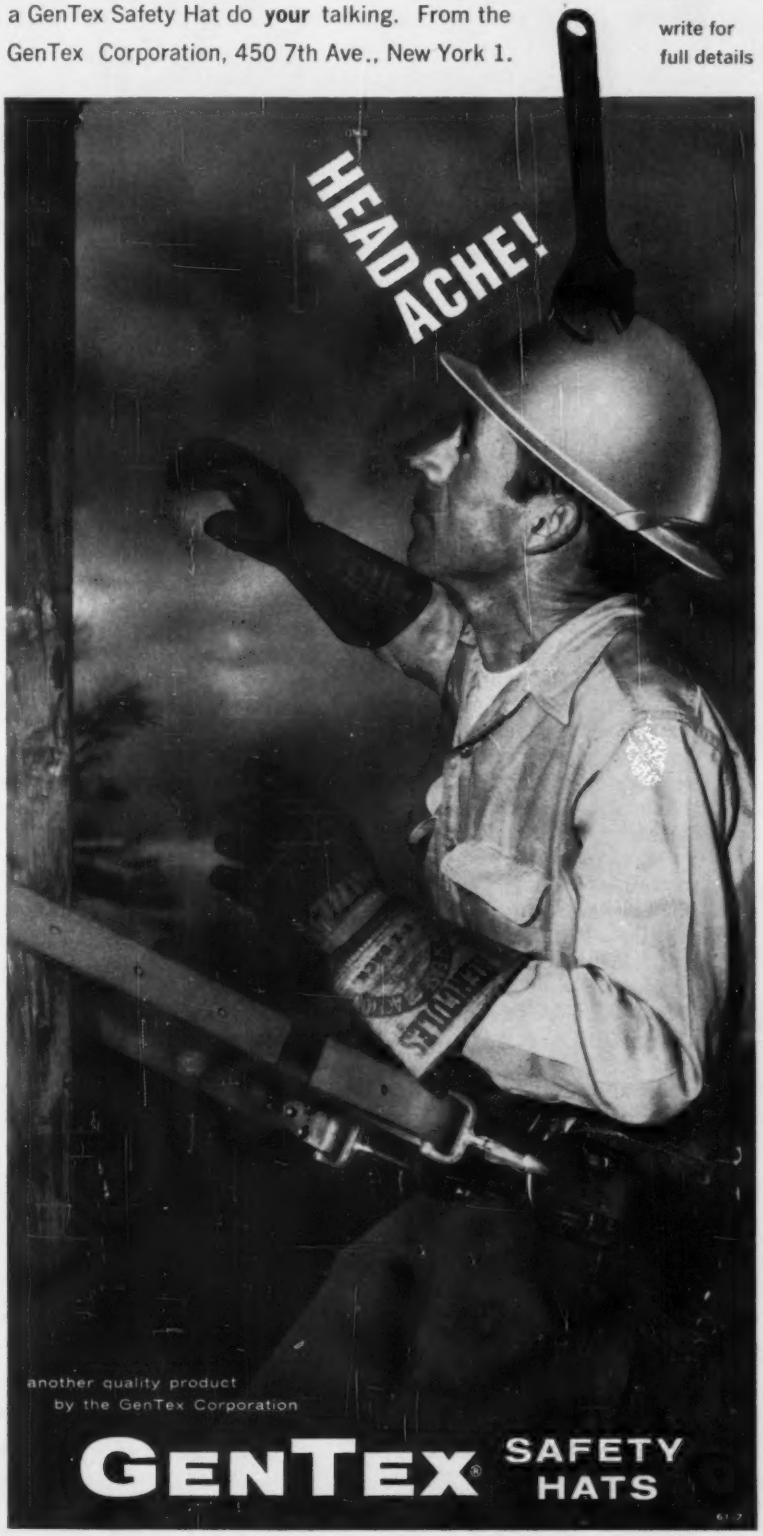
'Owl' Frightens Birds

In an effort to combat "bird nuisance," Public Service of Indiana is enlisting two-faced plastic owls—made up with eyes which make them look sufficiently realistic to frighten away feathered intruders.

Starlings and other birds that roost on electrical relay or transformer stations are a constant source of damage and interrupted service. The effectiveness of this experiment has yet to be determined; however, when the above photo was snapped, the owls had the roost all to themselves.

The GenTex Safety Hat . . . your way of looking out for yourself on the job. With an impact resistance of better than 40 foot-pounds and a penetration resistance of less than ¼", the GenTex is the hard hat with heart. So when someone up above shouts "Headache," let a GenTex Safety Hat do **your** talking. From the GenTex Corporation, 450 7th Ave., New York 1.

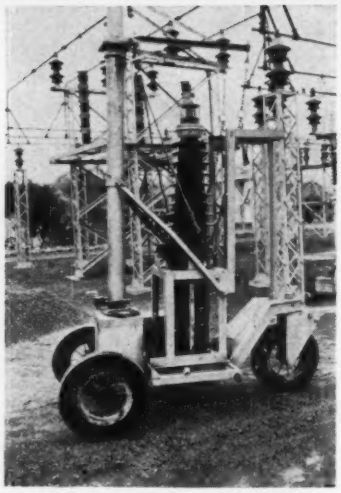
write for full details



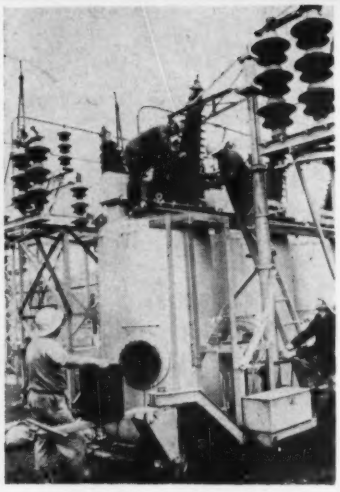
ELECTRIC UTILITY METHODS

E u m

MAINTENANCE & REPAIR



HYDRAULIC LIFT is run in close to, and is clamped to OCB in order to provide additional support



END OF BUSHING is tied with rope to prevent tipping over after breaker bushing is unbolted . . .

Custom Hoist Cuts Hazards In OCB Bushing Change-Out

A. O. BROWNE, Elec Supt of Stations, Western Massachusetts Electric Co, West Springfield, Mass.

Mechanical and electrical hazards normally involved in changing out of substation OCB bushings have been minimized at Western Massachusetts Electric Co by use of a job-fabricated hydraulic hoist. Furthermore, the time required for change-out has been reduced appreciably.

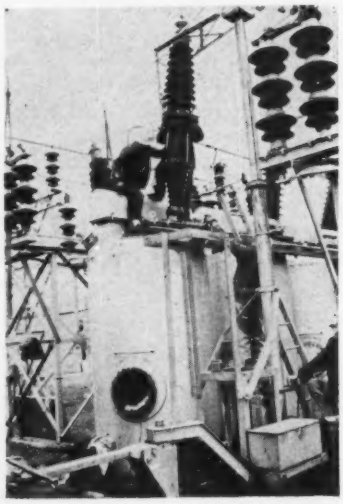
Often, the problem of changing substation bushings (with a low ring bus having no steel structure over the oil circuit breakers) presents many rigging problems, particularly with the 66-kv and 115-kv GE Type OF—the 115-kv class weighs about 1,000 lb. The space between OCB's and isolating disconnects is often so small that it is difficult, if not impossible, to get a truck with a normal boom close enough to lift the bushing. It also means tying up a high-priced truck for a whole day to change two bushings. Furthermore, the mechanical hazards and electrical hazards of the long temporary boom required make a different method of handling desirable.

A job-fabricated, hydraulically-operated lift which can be run in close to, and temporarily clamped to, the OCB for additional support solved all of our problems. The hoist consisted of a hydraulic lift made of 5-in. Shelby tubing and operated by a small gear pump driven by a ½-hp motor using oil for the liquid. This whole structure was mounted on a war-surplus three-wheel cart.

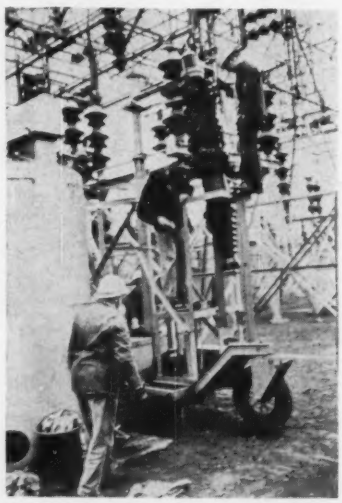
The procedure for use is as follows: The cart is run in close to the OCB with the arms on either side of the bushing. An angle iron is clamped between the top of the hydraulic cylinder and the frame of the OCB for additional stability. Hooks on the chain are hooked to bent eyebolts in the bushing flange. A piece of rope holds the upper end of the bushing from tipping over. After the bushing is unbolted and freed with a pinch bar, the lift raises the bushing clear of the OCB. The bushing is then swung around and lowered partway to a support where it is set down. The chains are lengthened and the bushing lowered the rest of the way to the support on the cart. The bushing is then rolled over to the storage and transfer rack.

After the bushing is positioned on the rack, a new rebuilt bushing is placed on the cart and rolled over to the OCB and installed in the reverse order of the above procedure.

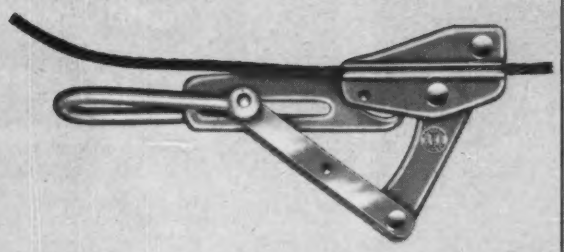
From the storage rack, bushings are transferred to a frame on a truck and taken to the shop for rebuilding and modernizing.



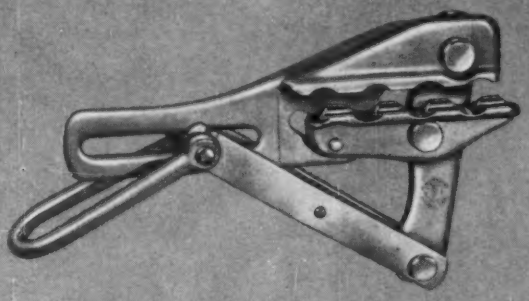
. . . and freed with a pinch bar, the portable hydraulic lift raises the breaker bushing clear of the OCB



BUSHING is swung around and lowered part way to a support. Chains are lengthened and unit is set down



1656-40B with bronze-lined jaws. Specially designed for bare A.C.S.R. aluminum and stranded copper cable.
Opening from .50 to .74 inch.

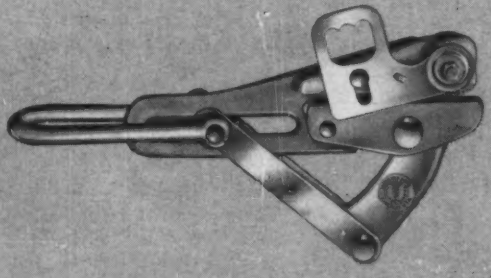


Machined jaws allow snaking insulated conductors, eliminating slippage and preventing conductor damage. Insulation does not have to be stripped from conductor.
1659-40—openings from .49 to .80 inch.

60 DIFFERENT KLEIN GRIPS MEET EVERY UTILITY NEED

If you want a strong, nonslipping grip for use on any type of conductor . . . if you need a pattern specially designed for hot line work . . . consult your Klein Catalog. Klein grips are designed for solid and stranded cable, for messenger guy strand and wire rope, and for weatherproof wire.

Write for the Klein Grip Selector to make sure you have the proper grip for every job.



This hot line grip may be placed on wire with stick. Safety latch has three positions and closes automatically when stick is removed. Cannot fall off wire. Can be used for hot or dead work.
1628-5BH—openings from .198 to .522 inch.

FREE GRIP SELECTOR

To utility companies, the grip selector is available without charge. It shows the proper Klein grip for any type of wire and gives full information for servicing and maintenance.

ASK YOUR SUPPLIER
Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
INCORPORATED
7200 McCORMICK ROAD, CHICAGO 45, ILL.

1ST CHOICE of UTILITY COMPANIES!

HKP® PORTER COHARDITE INSULATED ELECTRIC WIRE CUTTER

For Fastest Safest • Surest Live Wire Cutting!

• Made with utility men in mind! • Cuts insulated wire soft or medium hard, solid copper wire and medium hard steel wire up to ½"! • Rugged, durable handles, Cohardite insulated • Factory-tested to 20,000 volts! Also available with round edge jaws for harder wire.

The TN STEEL CABLE CUTTER

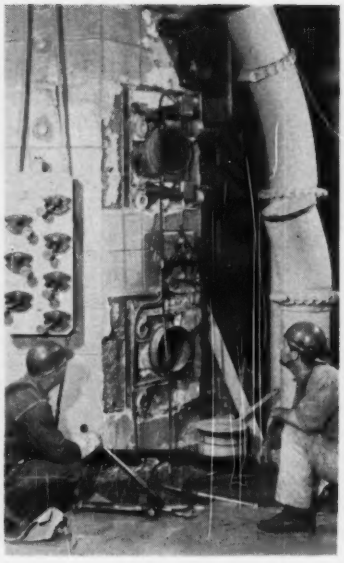
For Steel Cable & Wire Rope
Shear-action cutter — cuts all soft or hard steel cable and wire rope up to ¾"! No deforming of wire — notched jaws lock cable during cut! Cuts fine or course stranded cable easily and cleanly.

2 CN SPECIAL SHEAR CABLE CUTTER

For Copper and Aluminum Cable
Cuts soft, non-steel cables, insulated or not, up to 1⅜"! O.D. Jaws pass each other for clean cutting! A "must" for every company using Copper or Aluminum Cable. Not recommended for ACSR.

Order from your supply house or write direct for free PORTER CATALOG — Showing many other tools for utility companies.

HKP®
H. K. PORTER, Inc.
Somerville 43, Mass.



HYDRAULIC RIG helps remove burner nozzles at TVA's Kingston Plant

Rig Removes Burner Nozzles Easily

A hydraulic rig, job-fabricated by boilermakers at the Tennessee Valley Authority's Kingston Plant, simplifies removal and reinstallation of boiler nozzles. The rig eliminates the hazards associated with nozzle removal and cuts labor time by 60 to 70%.

Furnace burners at the Kingston Plant have to be replaced, on the average, every 18 months. They are hard to install and harder to remove. The nozzles are a close fit and the burner boxes are in crowded places, all of which makes the work more difficult and hazardous than otherwise would be the case.

To solve the problem, the boilermakers made up a heavy, two-piece "removal" yoke and bolted it around the outer end of the nozzle. With this in place, two hydraulic jacks were placed between the yoke and the burner box frame. With this arrangement, the burners are easily removed.

To reinstall a new nozzle, the above procedure is reversed—however, only one hydraulic jack, used with a second special "reassembly" rig, is required.

SHAW-PERKINS COOLING RADIATORS

. . . properly designed to cool power and distribution transformers

Designed and built by the pioneers and specialists in economical, dependable self-cooling methods. Sizes and models for any make transformer. Valves, flanges, elbows available. Transformer tanks built to customer's design.

Write for full information. SP-11

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CIRCLE 128 ON READER SERVICE CARD

To the man on the route slip...
...the $6 you save
—Is it worth it?

- **Stacks of dog-eared copies piling up on your desk . . .**
- **The risk of missing something you should know about today . . .**

Your name, residence address, title, and company on a post card will bring 52 weekly issues of Electrical World directly to your home. You can pay the $6 later. Address: Electrical World, Dept. H-2, 330 W. 42 St., New York 36, N. Y.

Whether a Winch Line Hook or a complete Line Body check your requirements with

UTILITY TOOL & BODY CO.
CLINTONVILLE, WISCONSIN
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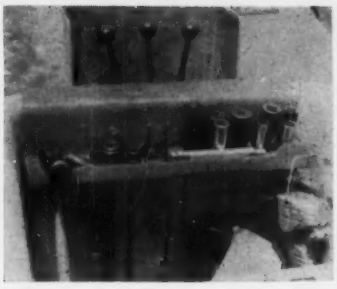


Fiberglas Rack Is Ideal for Basket Work

TRUBY JONES, District Supt, Polk County Div, Tampa Electric Co, Winter Haven, Fla.

A low-cost Fiberglas tool rack, developed by Bob Heinly of Tampa Electric Co, Winter Haven Fla., provides a convenient and efficiently arranged place for the safe storage of all "basket-lineman's" tools. Regardless of which side of the basket the lineman works from, the rack holds his equipment within easy reach, yet does not hamper his movements while he is working.

The rack may be transferred to any side of the basket quite easily, since its formed shoulder simply sits snugly over the lip of any of the four sides of the basket. Because basket liners are used at Tampa Electric, the tool holders were fully tested from the inside to the outside surfaces for insulative value to insure that the lineman's safety would not be compromised.

The tool-holder frame was made by a local Fiberglas product manufacturer for about $6.50. Cutting the holes for the individual tools was readily accomplished in Tampa's shop.

(More Maintenance on p 108)

Why you can be sure Lamplighter offers long use and low cost.

BECAUSE the design of this new photoelectric control offers every industry need for roadway lighting in one unit.

BECAUSE standards committees everywhere have tested Lamplighter alongside other similar devices giving Lamplighter a well-earned "approved" stamp.

BECAUSE Lamplighter cuts replacement problems in the event that you should raise light intensities in the future.

BECAUSE Lamplighter is engineered by people who understand your problems and know the intricacies of the lighting business.

BECAUSE Lamplighter is constructed of prime component parts.

BECAUSE Lamplighter *does* cost you less and because maintenance is minimal.

We have the right answers and the right product for *your* automatic lighting needs. Write —

The Acme Wire Co.
Utility Products Division, Dept. MP-1B
New Haven 14, Connecticut

LAMPLIGHTER
photoelectric lighting control

'Life Guard' Hats & Caps

The best in head protection for electrical/construction workers

Jackson's 'Life Guard' safety hats and caps safely resist over 20,000 volts, and they also provide impact resistance to more than satisfy federal requirements for safeguarding construction workers.

'Life Guard' safety caps have narrow brim around sides and back, visor in front. Injection molded plastic is strong yet flexible, has a soft comfortable feel. Caps may be ordered with attached welding helmets, goggles, and assorted face shields.

Standardize on this all-purpose safety hat for maximum head protection. Identify work categories by issuing these different hat colors: white, yellow, grey, and orange.

'Life Guard' safety hats offer neck protection with wide brim all around. The 'Life Guard' headgear is instantly adjustable in hat sizes, and its comfort keeps the hat where it does its job, on the worker's head. Chin straps and warm winterizers are available.

Sold by better welding supply and safety product dealers everywhere

Jackson Products

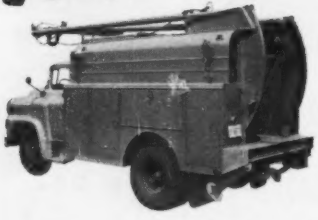
AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

31739 Mound Road, Warren, Michigan

Send for free 16 page catalog!

CIRCLE 130 ON READER SERVICE CARD

Koenig ALL-STEEL **UTILITY BODIES**



LINE-CONSTRUCTION BODY

. . . available in 9' to 14'6" lengths with mechanical or hydraulic winch and derrick, or any other special or custom equipment desired. Compartments can be arranged to your specifications.

SERVICE BODIES

. . . for ½-, ¾-, and 1-ton chassis. Electrically welded into one unit with six waterproof compartments, recessed paddle handles keyed alike and fender skirt protected with die-formed rolled edges. Built for safe, dependable service . . . will outlast several chassis.

SIDE BOXES

For all pick-up trucks, including the new compacts. Watertight compartments . . . double panel doors . . . recessed paddle handles with cylinder locks keyed alike. Eleven types, seven lengths available.

YOU CAN BE SURE OF QUALITY MATERIALS AND WORKMANSHIP WHEN YOU SPECIFY KOENIG PRODUCTS

Write for literature and specific information today.

Koenig IRON WORKS, Inc.

P. O. Box 7726, Dept. C
Houston 7, Texas

Device Simplifies

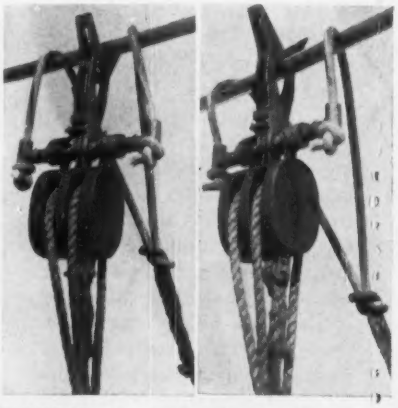
MAYO T. BARBOUR, Sr Elec Foreman,
Elec Maintenance Section,
Los Angeles Dept of Water & Power, Los Angeles, Calif.

A self-latching and releasing hook simplifies the mechanic's job of rigging on and then removing boatswain's chair from station busses at Los Angeles Dept of Water & Power.

The simple device, developed by the author, and safety-tested to 3,000 lb, saves time and minimizes the difficulty involved in jobs in which a mechanic must work from a suspended boatswain's chair—say, from a 1,000 MCM copper cable, as required to disconnect an oil circuit breaker from the 138-kv bus.

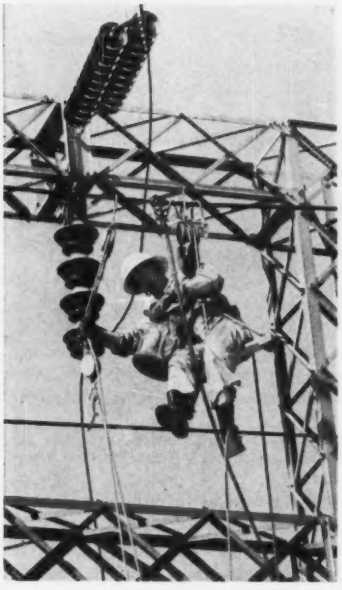
The chair is rigged in a few minutes with the aid of the hook. First, one end of a hand line, the other end of which is attached, is passed over the bus and is used to raise the upper tackle block, which is an integral with bus-hook device. Upon contact of the bus with the angle profiles of the hooks, the hooks are forced apart; as bus enters between hooks, they snap closed over it.

When the lineman has completed his assigned job and the boatswain's chair is to be removed, the same headline originally used to "hook-on," is used to "unhook." Unhooking is accomplished from the ground by pulling still further on the hand-



RIGGING: bus presses hooks open; as bus enters between hooks they lock closed to support the falls

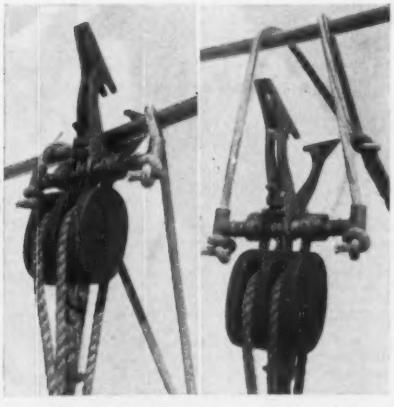
Rigging Bos'n Chair



SELF-LATCHING, SELF-RELEASING hook simplifies rigging and removal of bos'n chair as indicated below

line—as the hooks rise higher, with the bus between the hook shanks, they are forced further apart to such a degree that they finally latch open. The tackle is then lowered to the ground with the handline. One of these devices is permanently kept at each Los Angeles DW&P 138-kv station where breakers cannot be isolated from the bus by disconnecting switches.

(More Maintenance on p 110)

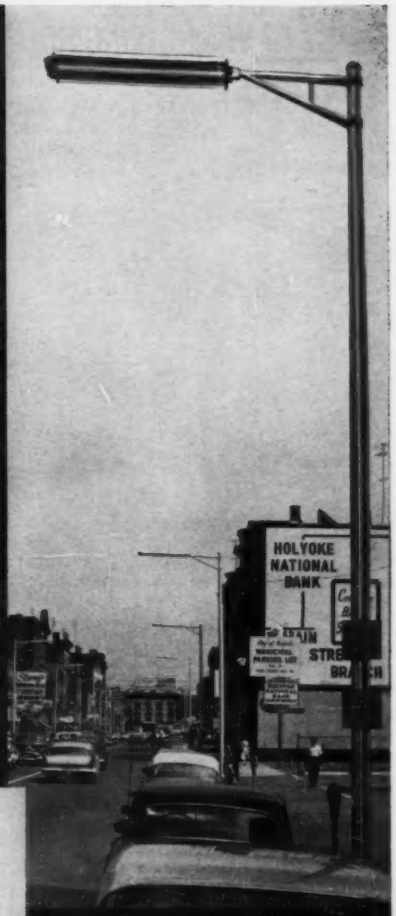


REMOVAL: raising hooks higher forces them apart, whereupon they lock open for lowering to ground

MODERN
IN MATERIAL,
IN STYLE,
IN LIGHTING
EFFECTIVENESS

P&K

"PACKAGED"
LIGHTING
aluminum standard
and luminaire



FOR STREET LIGHTING
City of Holyoke, Mass. chose the P&K "packaged" LUXaire unit for their new street lighting installation, consisting of 30 foot mounting height tapered aluminum standards and 6 foot fluorescent 600 watt luminaires. "Best light source in the city" says City of Holyoke, Gas & Electric Dept.

FOR AREA LIGHTING
King's Dept. Stores, Inc., Brockton, Mass. parking area gets all the light it needs to invite shoppers to park in safety. Distinctive P&K "Starburst" design minimized cost yet provided maximum illumination.

It's a fact, P&K lighting standards are modern in total concept: made of aluminum to provide light weight with strength ... styled in timeless good taste with a functional design that minimizes inventory of parts and speeds installation... and most important of all... P&K provides the complete "package" to assure the maximum of lighting effectiveness. And of course, handling standards and luminaires from one reliable manufacturer makes your job so much easier. For latest P&K catalog information, ask your P&K representative or write.

PFAFF & KENDALL
84 Foundry Street
Newark 5, New Jersey
BRANCH SALES OFFICE: SAN JOSE, CALIF.
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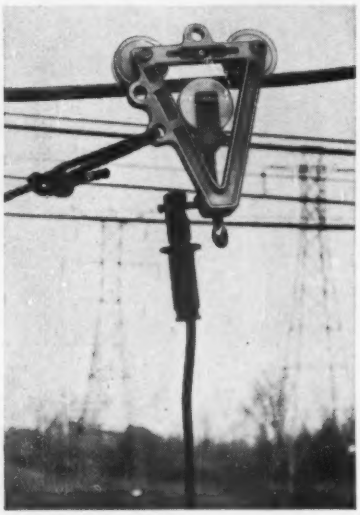
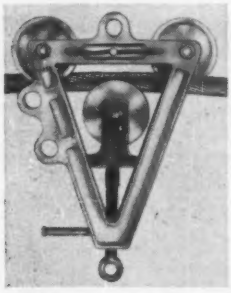
POWERLITE DEVICES, LTD.
Toronto, Montreal, Vancouver

for Safe WIRE STRINGING



Bashlin's precision built

TRAVELING GROUND



No. 795 Close-up view of the new Bashlin Traveling Ground for Safe Wire Stringing.

Here are features of the Traveling Ground you will recognize as essential for Safe Wire Stringing. 1. Positive ground. 2. Light weight. 3. Eye for hotstick pickup. 4. Bronze oiled bushings. 5. Brush pickup with shunts to common ground. 6. Brass shoulder bolt axle. 7. Adjusts for conductors to and including 795,000 cm. ACSR. 8. All parts replaceable. 9. Shouldered pin to attach ground clamp. 10. Operates in either vertical or horizontal position. 11. Can be installed without threading through. 12. A Heli-Coil thread is used in the frame.

Distributors in Strategic Areas in U.S.A.

EXPORT: Copperweld Steel International Co. IN CANADA: A. B. Chance Co. of Canada Ltd., Toronto

Write for your copy of supplement to Catalog No. 456 giving complete details.

W. M. BASHLIN CO.
GROVE CITY, PA.

Swamp Buggy Doubles in 'Snow'

A unique transport vehicle, dubbed by Jersey Central Power & Light and New Jersey Power & Light Companies as the "Rat", is being used to excellent advantage for emergency repair work and for year-round transmission-line patrolling, through swamps, deep snow, and flooded areas.

The machine is a light, amphibious, articulated track vehicle, capable of year-round transportation for personnel and equipment over terrain normally impassable on foot or with the more conventional types of transport equipment. The "Rat" can go through rivers, bogs and will float—powered by a Volkeswagen engine, it can be operated as a boat.

The machine, resembling two cars of a roller coaster with wheels that look like oil drums, was designed and manufactured by Canadair Ltd., Montreal, Canada. Originally purchased by JCP&L-NJP&L as a vehicle for patrolling transmission lines through swamp areas, its use has been extended to good advantage for deep snow patrolling and for emergency repair of lines during major snow storms—it is reported that the machine climbs over the snow instead of trying to push its way through.

CIRCLE 28 ON READER SERVICE CARD

(More Maintenance on page 111)

CABLE-MATCHED

OKOLITE tape is the perfect match for oil-base rubber insulated cables . . . provides high voltage protection . . . fuses into a solid mass to replace the cable's original insulation.

Other cable-matched Okonite tapes:

OKONITE—for mineral-base rubber insulated cables.

OKONEX—for insulating butyl splices and terminations.

OKOPRENE—neoprene blend for jacketing.

OKOWELD—for insulating and sheathing in one application up to 2000 volts.

MANSON—super-strong friction tape.

The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

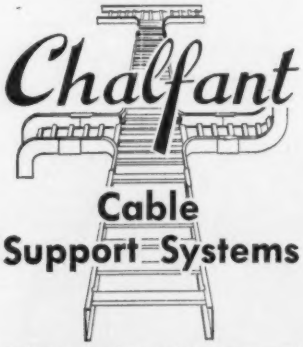
OKONITE splicing materials
80 years of cable craftsmanship
CIRCLE 131 ON READER SERVICE CARD

You DON'T Need

BOLTS WASHERS NUTS PINS

or Special Tools to install

Chalfant

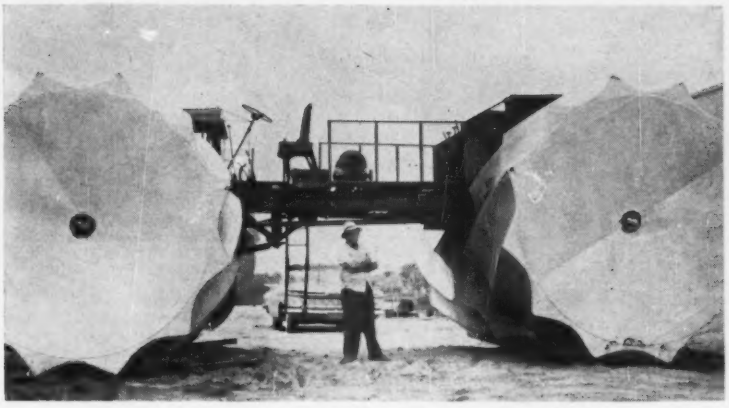


Cable Support Systems

Chalfant Splice Plates and Trays are securely fastened by the exclusive Chalfant Crimping Method . . . to reduce installation time way below conventional methods. Lower costs are also achieved with Chalfant systems because each splice plate and tray is made from high quality, longer lasting, economical Aluminized steel.
You'll save 15% on material and 40% on installation when you use Chalfant Systems to produce a better job.

Write for Catalog

CHALFANT PRODUCTS CO., Inc.
11531 MADISON AVENUE
CLEVELAND 2, OHIO



Giant Buggy Romps Over 'Trembling Prairies'

The Jefferson Davis Electric Cooperative solves marshland transmission line construction and maintenance problems by using various oversize marsh buggies.

The buggies, rented from Crain Brothers, the builders, of Grand Chenier, La., range from the mammoth vehicle shown above, to much smaller units.

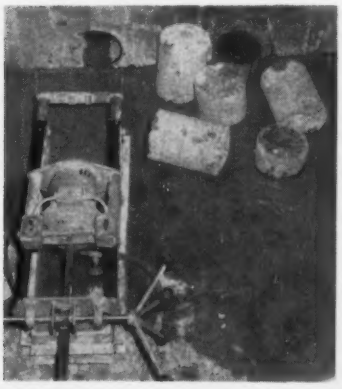
Jeff Davis Co-op selects the specific size and type of buggy required—not only to haul men and equipment into the work site, but also to provide the muscle and dexterity to set poles, string wire and repair lines along their 60-kv marshland transmission line.

The buggy's hollow wheels allow for pulling large heavily-loaded swamp barges across the so-called "trembling prairies."

CIRCLE 29 ON READER SERVICE CARD

Concrete Drilling Service Has Its Advantages

A "service for hire" now will quickly drill ¼ to 20-in.-dia holes through reinforced concrete or other masonry materials without noise or dust. What's more, the holes are achieved to size without chipping or cracking.



This service, provided by the Geo-Drill Co, Bridgeville, Pa, is designed to meet the needs of maintenance and construction groups for the installation of electrical conduit, underground cable, anchor bolts, openings for doors, ducts, etc. The holes are drilled with a special drilling rig using commercial diamond-drill bits. Drilling is fast—up to 2 in. of a 6-in.-dia hole per min,—with up to 100 ft in length accurately controlled.

Of course, utility construction and maintenance crews normally handle this type of work without undue difficulty; however, in special cases, bringing in a specialist for a "one-time" type of job could achieve significant cost and time savings—particularly for small system companies.

CIRCLE 30 ON READER SERVICE CARD

TWO GREAT EMERGENCY TOOLS

BARTLETT

No. 1-BC Wire Cutter
No. 1-WJ Jointed Tree Trimmer

No. 1-BC readily cuts 110 and 220 RC wire and can be used safely for cutting hot 4800 volt primary and service wire when hanging near ground. Has 12" Bakelite insulator. Two 6 ft. pole sections make operation from ground easy.
No. 1-WJ Tree Trimmer will sever 1¼" branches. Pulley action gives added cutting power. Pole in 4' sections for ease of transportation in small car. No. 1-W made with long poles. 6-8-10-12-14 or 16' ft.

Write for Catalog No. 41 showing complete line of trimming tools.

BARTLETT MFG. CO.
3048 E. Grand Blvd. Detroit 2, Mich.

CIRCLE 133 ON READER SERVICE CARD

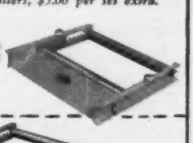
- Easily portable
- No jacks
- Handle any reel diameter
- Heavy steel frame
- Slanted front
- Ball-bearing, adjustable rollers
- Positive roller lock for unloading

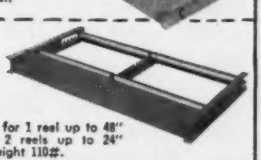
Load cable, wire, rope or anything on reels onto Roll-A-Reel for easy, smooth pay-out or take-up.

All are drilled for optional auxiliary ball-bearing side rollers, $3.00 per set extra.

STYLE A

2,000 lbs. cap. for reels up to 28" wide. Weight 60#.
PRICE $45.50
f.o.b. Cincinnati





STYLE B

4,000 lbs. cap. for 1 reel up to 48" wide; or for 2 reels up to 24" wide each. Weight 110#.
PRICE $84.50
f.o.b. Cincinnati

• Special sizes on request.

ROLL-A-REEL

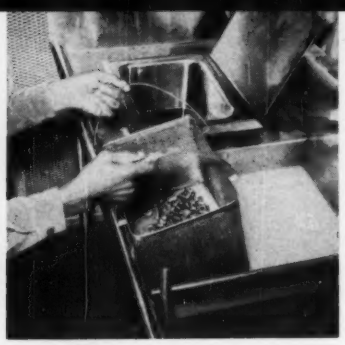
4628 Reading Road Cincinnati 29, Ohio

ELECTRIC UTILITY METHODS

E u m

STORES & SHOPS

SONIC CLEANING of connectors (in detergent) takes about two hr



BRIGHTENING connectors requires a 3-60 sec soak in special solution

Salvaged Connectors Save $50,000 Annually

J. P. McGAUGHAN, General Storekeeper, Tampa Electric Co, Tampa, Fla.

High-frequency cleaning is helping Tampa Electric Co to salvage $30,000 worth of brass connectors and $20,000 worth of galvanized clamps annually. Furthermore, with the new method, the appearance of salvaged connectors is good and threads work as easily as threads on new units. As a result, linemen readily accept them.

The salvage problem at Tampa revolves around a new ultrasonic cleaner as operated in conjunction with a special solvent, detergent and brightener. The details of the salvage program involve pre-cleaning, sonic cleaning and an after treatment.

The details of pre-cleaning vary, depending on the initial condition of the connectors. Tape-wrapped connectors are soaked in kerosene oil for 24 hr to soften the tape and facilitate its removal. After the tape has been removed, the connectors are rinsed in kerosene oil and the excess kerosene is allowed to drip off. Connectors are then soaked in carburetor cleaner for 2½ hr. After having been soaked in the carburetor cleaner, the connectors are rinsed thoroughly in cold water and spread on a wire rack to dry. The wire is then manually removed and connectors are sorted according to sizes and types, and inspected. When the nuts are found to bind, the connectors are scrapped. Connectors scrapped are a small percentage of those handled.

Throughout the pre-cleaning operation, the connectors are stored in ordinary wire baskets; any type of metal containers hold the kerosene, carburetor cleaner.

Galvanized clamps are treated as above but do not get the sonic treatment—the sonic cleaning solution darkens the galvanizing.

Sonic cleaning accomplished with a Son Blaster by (Narda Ultrasonic Corp, Westbury, N. Y.) is augmented by a special "detergent" and a special "brightener." When the pre-cleaned connectors are completely dry, they are placed in the detergent-filled stainless steel sonic cleaning tank. Cigo Sonic No. 4, determined as the best detergent suited for connector cleaning, is formulated by Chemical Industries, Inc, St. Petersburg, Fla.

After being treated in the sonic cleaner for 2 hr, the connectors are placed in an adjacent stainless steel tank, and thoroughly rinsed in cold, running water.

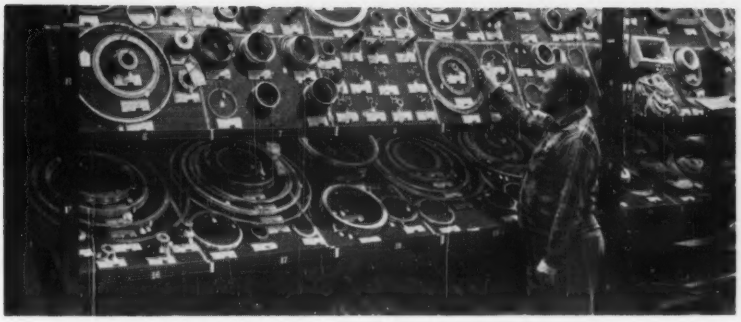
When the connectors have thoroughly dried, and only then, they are soaked in a stainless steel tank containing Krometone brightening solution for a period of 3-60 sec, depending upon the type and size of the connectors. There is some element of judgment in this operation, with appearance being the guide to proper timing. Too long an exposure to this treatment may cause the connectors to darken. Krometone brightener is a product of Momar, Inc, Atlanta.

After the brightening operation, the connectors are again rinsed thoroughly in cold water, after which they are dunked in a soap solution consisting of two large handfuls of soap to 5 gal of water. Ivory soap proves satisfactory for this purpose—and other soaps might set up an adverse chemical action. After this final treatment, the connectors are not rinsed. When dry, they are ready for reuse.

To avoid contamination of detergent and brightener, separate treating tanks and separate water rinsing tanks should be used. Tampa Electric built a special stainless steel tank. It has two compartments. The Cigo Sonic No. 4 treating tank is on the far left and its water-rinsing tank is adjacent, to the right. The brightener treating tank is on the far right and its water tank is adjacent, to the left.

This whole salvaging operation required $1,777.50 worth of equipment and requires about two-thirds of one man's time. The cost is small compared to the equipment reclaimed. The reclaiming of 100 more connectors a day, as a result of the sonic method of cleaning and brightening, at an average cost of 33¢ ea, amounts to $858.00 a month and a total of $10,296.00 a year. Added to that can be the unknown value of the discolored connectors which, in the past, were thrown away by linemen because they were recognized as being second-hand. The majority of the connectors, refinished under the new method, cannot be distinguished from new ones.

CIRCLE 31 ON READER SERVICE CARD



Display Board Eliminates 'Searching'

JAMES ELKIN, Storekeeper,
Beckjord Station, Cincinnati
Gas & Electric Co, Cincinnati, Ohio

Selection of the proper gasket from an inventory of 333 different types and sizes used in the operation of the Walter C. Beckjord Station of the Cincinnati Gas & Electric Co is easy with the help of the display-type "Gasket Board." The display board eliminates time-consuming forays through storage bins for a specific gasket.

The three-tiered board measures 10 by 20 ft. It is made of 16-gage peg-board shelving, which permits the placement of display hooks at many different positions. All totaled, the board supports 3,047 gaskets, the entire stock at the plant.

Four 48-in. fluorescent lights illuminate the board. Other equipment includes a special ladder for reaching high hanging gaskets and bin cards which list the stock number and description of the gaskets, ranging in diameter from ⅝ to 28⅛ in.

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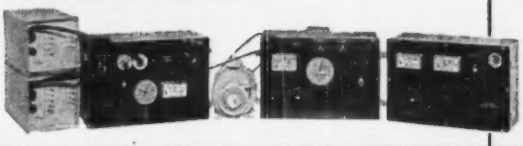
PORTABLE RELAY TEST UNITS FOR PROPER TESTING & MAINTENANCE OF SWITCHGEAR COMPONENTS



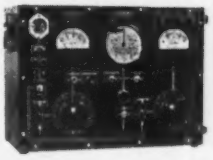
Type RA1-1 Nelson portable test units which may be used in combination for complete testing of switchgear components.

USE NELSON RELAY TEST UNITS TO

- **Improve Operating Performance**
- **Eliminate Excessive "Down-Time" when testing switchgear.**

Up to now a complete rewiring job was necessary to test each different device in a piece of switchgear. Nelson's field service department, working with Nelson's engineering and research departments, has produced a portable relay test unit that will test relays, meters, coils, circuit breakers, etc.

Use Nelson test units to reduce testing time, "down-time" and eliminate much lost production due to present testing methods.



Type RD1-1 Nelson portable test unit for simple testing of meters, protective relays, overload heaters, tripping coils, etc. For use with AC circuits only.

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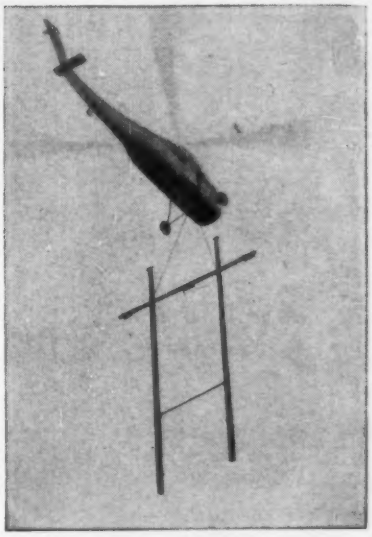

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T ree trimming

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More than 13 years ago Bartlett successfully pioneered the use of the helicopter for shade tree spraying—an operation that was to lead the way, a few years later, to a new efficient method of control of woody plants along utility rights-of-way.

At first, difficult terrains presented unusual problems but gradually through research and experience, new equipment was developed and new herbicides and techniques perfected to overcome them. Today, Bartlett research in this important field is carried on continuously through college fellowships and at the Bartlett Research Laboratories.

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Home Office, 2770 Summer Street, Stamford, Conn.
Research Laboratories and Experimental Grounds, Stamford, Conn.

Sight Glass Cover Protects Workmen From Burns

CLYDE O. MYERS, Unit Foreman, Clifty Creek Plant, Indiana-Kentucky Electric Corp, Madison, Ind., AEP System

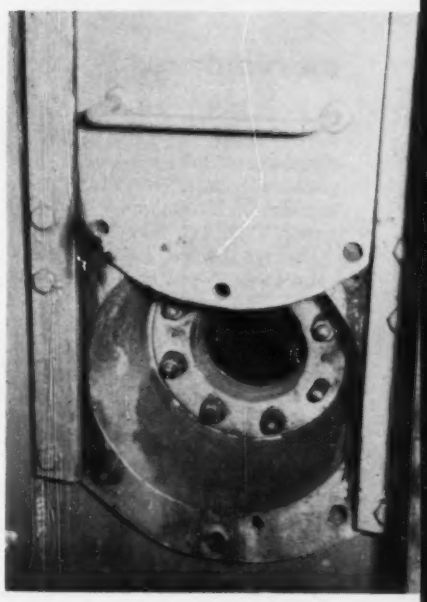
A quick-closing emergency cover plate, rapidly dropped into position over a broken ash-hopper sight glass, now protects workmen from burns at the Clifty Creek Plant of Indiana-Kentucky Electric Corp. Furthermore, much clean-up labor is saved and equipment damage is minimized, because the guard prevents water and ash from spewing out into the work spaces.

Formerly, when cover plates were bolted in place above the porthole, a man was in danger trying to remove the bolts to fasten the cover over the broken glass. Job took some time—in the face of hot water and ashes pouring through the opening.

The new sliding cover plates now installed on all ash hoppers have worked very well the few times we've had occasion to use them. A man can stay 10 to 15 ft away from the broken sight glass and trip the cover plate so it drops over the broken glass. Two brackets, welded to the ash hopper, support the cover plate so it can slide. Normally, it is held up by means of a hinged hook and bolt with its head welded to the cover. The hinged hook is connected to a trip chain tied off to one side. Should a sight glass break, the operator pulls the chain to release the hook, and the cover plate drops over the opening. Bolts for securing the cover are kept close by, partially threaded into nuts tack-welded to the ash hopper.

While the new arrangement protects workmen from burns, it also protects equipment from water damage and saves time formerly required to clean up the mess when a sight glass broke.

The revision takes about an hour per glass, using the original cover plate, plus $2.50 worth of material. In time-saving alone, this idea has paid for itself in less than a year.



SLIDING COVER affords immediate protection from hot water if ash-hopper sight-glass breaks. Normally, a hinged hook at top (not shown) keeps cover up so glass is visible.

Program 'Recalls' Safety Motto

R. BEITH, Manager & Secretary-Treasurer, Electrical Utilities Safety Assn of Ontario, Toronto, Ont.

Safety messages contained in visual training aids, safety programs or other safety activities can be re-presented effectively to employees through the "recall" technique. Among the electric utility members of the Electrical Utilities Safety Assn of Ontario, the recall method has been used to point up the accident prevention motto, "Take another look."

This motto, taken from a safety training film of the same name developed by Commonwealth Edison Co, is the foundation for a program reminding personnel that safety is the important factor in all work. Through the film, crews are encouraged before they begin an assignment to take another look for safety's sake.

To remind crews of the motto, following a showing of the film, 10-ft banners bearing the phrase were hung in conspicuous places and pocket savers carrying the motto were distributed to all supervisors. During the two-month period following, safety posters carried the motto to further the recall. In addition, many member utilities also acquired rubber stamps and marked work orders with the slogan.

An excellent example of the effectiveness of the program was found by a group of supervisors visiting the property of Orillia Water, Light & Power Commission in southern Ontario. One of the 10-ft banners had been suspended above the trail by the line crew, at a spot they had to pass daily to reach the job site after being flown in by airplane. It read "Let's Work It Safely—Take Another Look."

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DISTRIBUTION

LIGHTNING ARRESTERS . . . distribution-class, valve-type. Application features, ordering and dimensional information on three types: Type E5, direct-connected, 1 through 20 kv; Type SS direct-connected, 27 kv and 30 kv; and Type T5 externally gapped, 3 through 18 kv. Protection for transformer, capacitor bank, and underground distribution delineated through protective characteristic charts. Various lightning arrester and open fuse-cutout combinations suggested Bulletin LA2, 12 pages. Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis. **(150)**

INSULATORS . . . line-post, with wide wire grooves, higher mechanical strength and special seal. Locke line of 5 ASA standard units, 23 to 69 kv as well as data on line-post studs and associated mounting hardware. Bulletin TIA-182, four pages. General Electric Co, Schenectady 5, N. Y. **(151)**

GROUNDING SWITCH . . . high-speed, Type PGH, 23-34.5 kv at standard BIL and 46-115 kv at 450-kv BIL, with schematic and block drawings. Bulletin PPSE-110, two pages. Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis. **(152)**

INSULATED CABLES . . . with ozone, heat, and moisture-resisting butyl-base rubber high-voltage insulation for multi-purpose service up to 90C. Compared to ordinary cables, cables insulated with Okonex are said to carry heavier loads for a given size conductor, or the same load on a smaller sized conductor. Properties, characteristics, applications in 20-page Bulletin 1131, Catalog Sec. 7; with tuck-in supplement, 28 pages, which details ampacities, short-circuit currents and dimensional data. Okonite Co, Passaic, N. J. **(153)**

CABLE TERMINATIONS . . . various applications for cable accessory kits using special epoxy resin formulation and orlon tape. Use of epoxy-orlon system for making hermetic seals on 33-kv paper-lead cables, potheadless terminations in the 4 to 15-kv range, lead-sheath-crack repairs; also for insulating 500 MCM limiters, for making rubber-to-lead splices, low-voltage cast potheads and splices, and for 5-kv oil-stops. Four AIEE papers reproduced in booklet, 28 pages, by manufacturer of epoxy-orlon system, Epoxylite Corp, 1428 N Tyler, South El Monte, Calif. **(154)**

POLE TOP SWITCHES . . . 400, 600, 1,200 amp; 7.5 kv through 69 kv Design features, testing program described. Diagrams of horizontal mounting, wishbone mounting, vertical mounting and triangular mounting control arrangements. Catalog, Section 1, 12 pages. Powerdyne Inc, 17150 SW Boones Ferry Rd, Oswego, Ore. **(155)**

INSTRUMENTS

GAS-DENSITY DETECTORS . . . with general flow sheet for gas chromatography, details of detector elements, zero check, flow and density, how to calculate results. Illustrations of temperature-controlled cabinet, special pancake power supply and bridge control. Bulletin GADE 461, four pages. Gow-Mac Instrument Co, 100 Kings Rd, Madison, N. J. **(156)**

LEVEL RECORDER . . . instrument for indicating true level, compensated for changes in specific weight. Describes how instrument is applied to measure and/or control boiler-drum water level, or liquid level in similar closed vessels. Bulletin M31-2, two pages. Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio. **(157)**

CABLE TRACER . . . with descriptions of two methods for one man to trace up to ten conductors or pairs at once, with Amprobe unit, in pipe, conduit and non-metallic sheathed cable—reportedly in one-tenth the time normally required. Details of construction, identification by panel light, how tracer works with line drawings. Catalog CTC-1, four pages. Pyramid Instrument Corp, 630 Merrick Rd, Lynbrook, L. I., N. Y. **(158)**

CONNECTIONS . . . the Recorder-Controller Section of Scientific Apparatus Makers Assn and the American Boiler Mfrs Assn issued these recommendations jointly to standardize identification and location of instrument and control connections for power boilers. Units in 50,000 to 300,000-lb-steam-per-hr range. Booklet, "Recommended Standard Instrument Connections," $3.00. Recorder-Controller Section, SAMA, 370 Lexington Ave, NYC 17. **(159)**

MOISTURE METER . . . the Hygromite, portable, for unwanted gas moisture. Description of applications and operations for continuous monitoring water vapor between one and 1,000 ppm, with full-scale accuracy of ±5%. Bulletin 773, six pages. Beckman Scientific & Process Instruments Div, Fullerton, Calif. **(160)**

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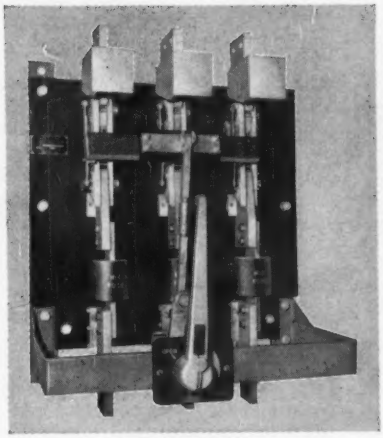
BUCKET-ELEVATOR SYSTEMS . . . for bulk handling of coal. Illustrations of wide selection of types: centrifugal discharge, perfect discharge, continuous bucket, gravity discharge elevator-conveyors and pivoted-bucket carriers. Table lists 101 different bulk materials regularly handled and 318 possible bucket-elevator types. Catalog be-55, 84 pages. Webster Mfg, Inc, Tiffin, Ohio. **(161)**



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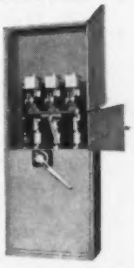

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SOOT BLOWER . . . air-driven, Vulcan T-30 Mark I-A, retractable, for travels up to 24 ft. Dual-air-motor drive described and infinite number of double-helix paths formed by jets on repeated cycles illustrated. Cutaway drawings of various parts with details of operation. Bulletin No. 1073, eight pages. Copes-Vulcan Div, Blaw-Knox Co, Erie 4, Pa. **(163)**

WATER TREATMENT . . . covering a wide range of boiler and cooling water-system troubles. Handy maintenance and troubleshooting checklist of recommendations. Includes description of company's five-point service program. Ionac Bulletin CS 113, four pages. Chemical Service Dept, Ionac Chemical Co, Birmingham, N. J. **(164)**

PUMP MOTORS . . . and drives. Condensed specification data on all products in company's line are covered, indexed for construction type, enclosure, thrust and type designations. Includes selection charts (for gear drives) and electrical specification material. Cutaway, cross-section, and detail drawings. Brochure F-2002, 20 pages. Bulletins are available on each pump motor and drive. US Electrical Motors, Inc, Box 2058, Terminal Annex, Los Angeles 54, Calif. **(165)**

THYRATRONS . . . how controlled, ratings, and a few typical applications. Ac control and dc control methods illustrated with graphs; applications, control of motors or other variable loads, and inversions with schematics. Tech Tips, Vol. 3, No. 4, four pages. CBS Electronics, Danvers, Mass. **(166)**

(More Literature on page 118)

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WIRE DE-REELERS . . . payoffs, takeoffs, tensioners, feeders, for both rolling reels and over-the-end (stationary) reels, with features of each described and applications recommended. Selection chart gives range of wire diameters accommodated, maximum and minimum tension, and reel dimensions for 18 different Amacoil de-reelers: ten types for medium and fine wires, six for medium, and two for heavy wires. Brochure, six pages. Associated American Winding Machinery, Inc, 750 St. Ann's Ave, NYC 56. **(168)**

MAINTENANCE

HELICOPTER SPRAYING . . . for brush control on hard-to-get-to rights-of-way. Application photos and general analysis, with folder attached describing invert herbicide method: emulsion, nozzle operation. Brochure, four pages. Stull Chemical Co, Box 6386, San Antonio, Tex. **(169)**

WEED & BRUSH CONTROL . . . analysis of vegetation problems and selection of right chemical or combination of chemicals to obtain results desired. Detailed description of use of various weed and brush killers by themselves, also in combination with other herbicides. Booklet, 12 pages. E. I. du Pont de Nemours & Co, Wilmington 98, Del. **(170)**

MAINTENANCE EQUIPMENT . . . safety belts, lanyards, and tree-trimming equipment, "climbers"—nylon safety straps and pads, Supplement No. 21, eight pages; also linemen's boots, gloves, safety hard hats and caps, "utility suits" and hooded linemen's rain suit, Supplement No. 22, 12 pages. Utilities Safety Supply Co, Inc, Jefferson St and Highway 50, Lee's Summit, Mo. **(171)**

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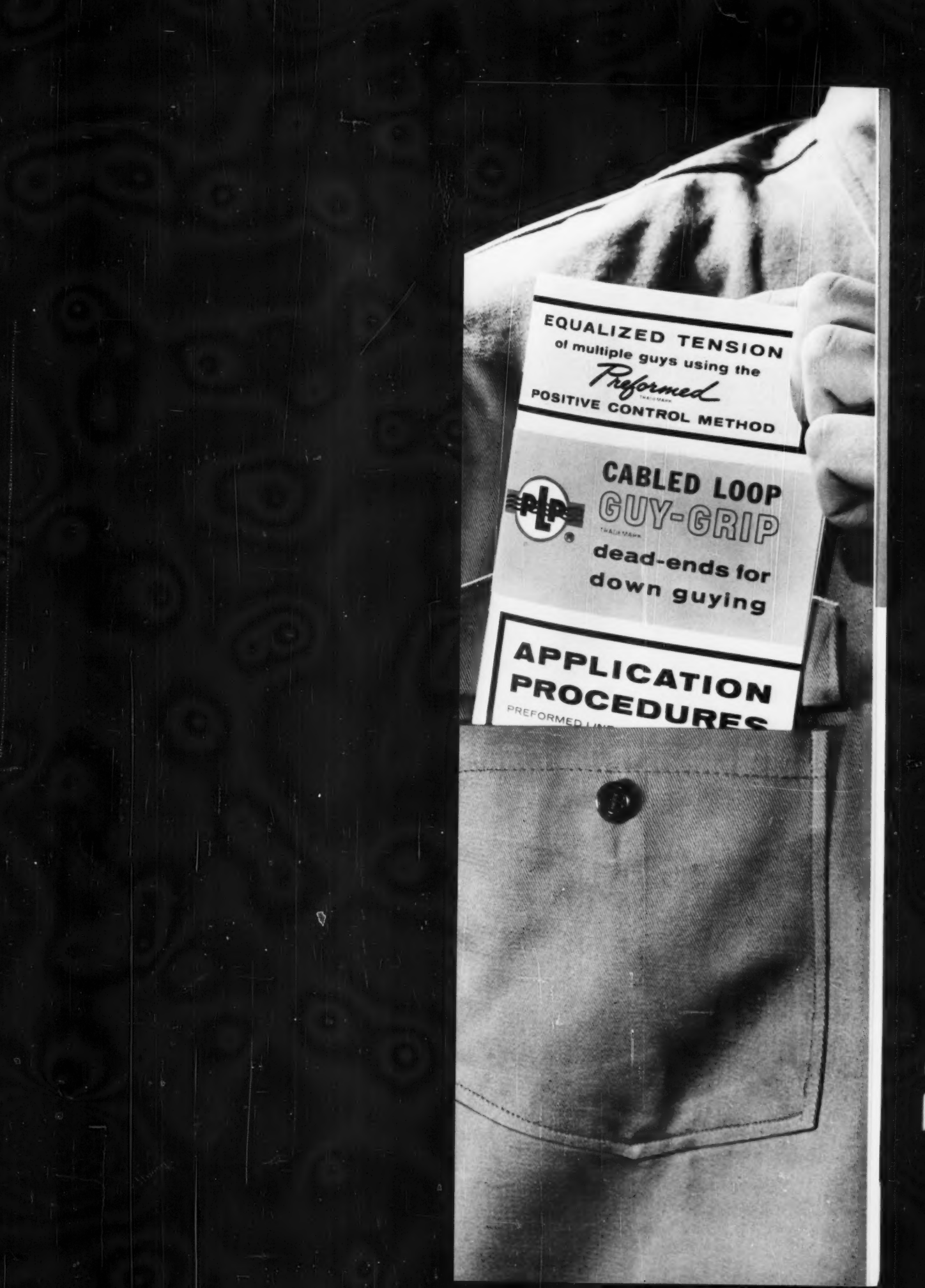
EQUALIZED TENSION
of multiple guys using the
Preformed
POSITIVE CONTROL METHOD
CABLED LOOP
GUY-GRIP
dead-ends for
down guying
APPLICATION
PROCEDURES

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EQUALIZED TENSION

of multiple guys using the

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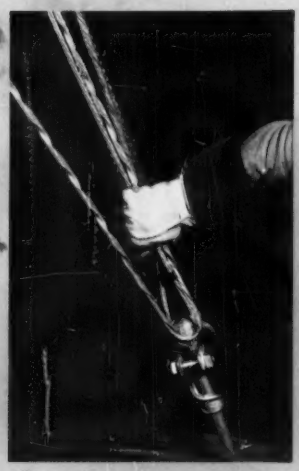
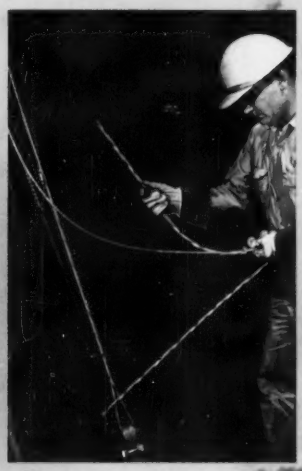


① Tension the new guy until the existing guy goes slightly slack —then cut the strand about 3" above the rod eye, and align the loop of the GUY-GRIP dead-end and the rod eye.



② Wrap one leg of the GUY-GRIP dead-end onto the strand several turns (as far as the *second* cross-over mark.)

EASIER with CABLED LOOP GUY-GRIP TRADEMARK dead-ends

PREFORMED LINE PRODUCTS COMPANY

5349 St. Clair Avenue
Cleveland 3, Ohio · UTah 1-4900
600 Hansen Way
Palo Alto, California · DA 4-2561

PLP® is a trademark which is registered in the U.S. Patent Office and is the property of Preformed Line Products Company.

You can look up to Preformed TRADEMARK

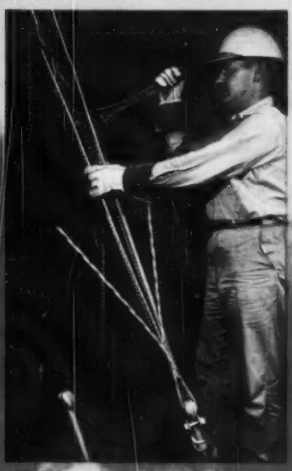
CIRCLE 121 ON READER SERVICE CARD

key steps...

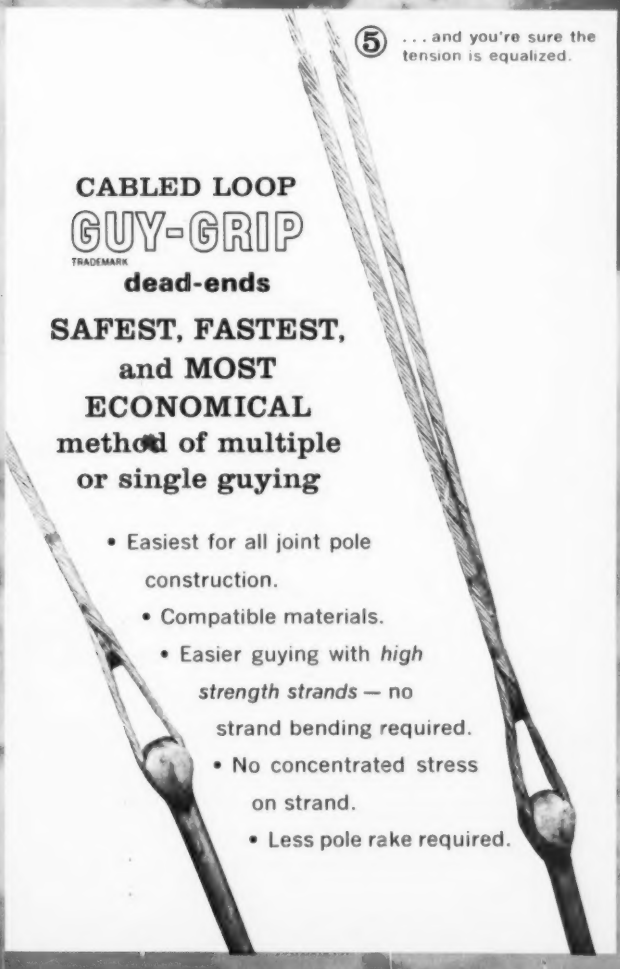
(shown here by a PREFORMED demonstrator)

UY-GRIP
and sev-
the sec-

③ Similarly wrap on the second leg of the GUY-GRIP dead-end as far as the second cross-over mark.



④ Back off the hoist until both guys are even. Complete the application of the GUY-GRIP dead-end to the strand. Repeat these steps for additional guys...



⑤ ...and you're sure the tension is equalized.

CABLED LOOP GUY-GRIP TRADEMARK dead-ends

SAFEST, FASTEST, and MOST ECONOMICAL method of multiple or single guying

- Easiest for all joint pole construction.
- Compatible materials.
- Easier guying with *high strength strands* — no strand bending required.
- No concentrated stress on strand.
- Less pole rake required.

The product in this advertisement is manufactured under one or more of the following: U.S. Patent No. 2,691,865 and 2,761,273; other patents pending.

Strongest of All!

Only CRESTOGRIP has this double strength BOX JOINT. All others have conventional lap joint.

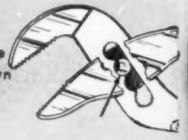
Grips Anything!

Flat, square, round or hex. objects. Adjustable to 4 positions up to 1½" capacity.

NO OTHER UTILITY PLIER LIKE CRESTOGRIP®

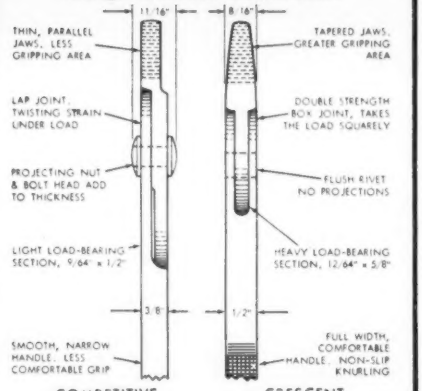
Easy to Adjust!

Simply "walk" the rivet recess over the bearing point (shown in cut-a-way view) with a pumping action of handles.



World's Thinnest!

Compare these dimensions

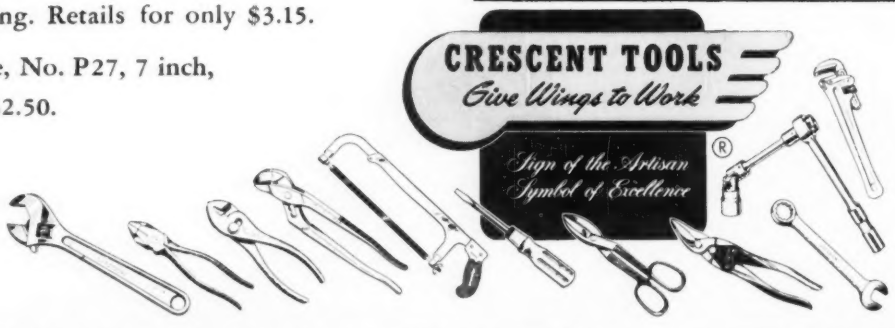

11/16"
8/16"
THIN, PARALLEL JAWS, LESS GRIPPING AREA
TAPERED JAWS, GREATER GRIPPING AREA
LAP JOINT: TWISTING STRAIN UNDER LOAD
DOUBLE STRENGTH BOX JOINT, TAKES THE LOAD SQUARELY
PROJECTING NUT & BOLT HEAD ADD TO THICKNESS
FLUSH RIVET NO PROJECTIONS
LIGHT LOAD-BEARING SECTION, 9/64" x 1/2"
HEAVY LOAD-BEARING SECTION, 12/64" x 5/8"
3/8"
1/2"
SMOOTH, NARROW HANDLE, LESS COMFORTABLE GRIP
FULL WIDTH, COMFORTABLE HANDLE, NON-SLIP KNURLING
COMPETITIVE LAP JOINT UTILITY PLIER
CRESCENT BOX JOINT UTILITY PLIER

Crescent's No. P210 CRESTOGRIP is a utility plier absolutely without equal. It's distinctive features, illustrated on this page tell why. Exhaustive tests against competitive tools prove CRESTOGRIP to be stronger, thinner in overall dimensions, and capable of greater gripping power.

This versatile tool measures 9½" overall, weighs a mere 12 ounces, yet gets in and grips where no other tool will do the job. Finished in rust resistant zinc plating. Retails for only $3.15.

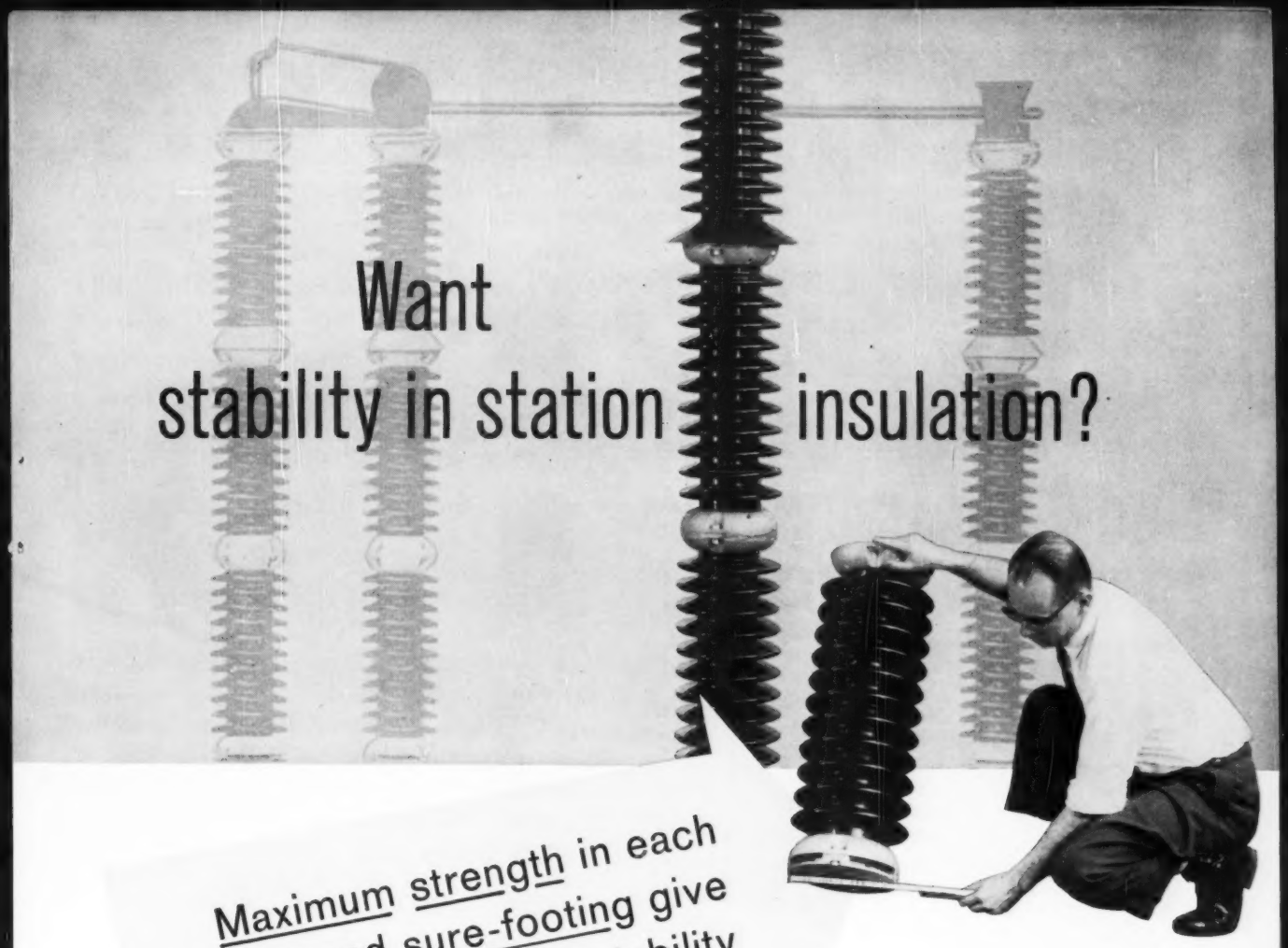
New smaller size, No. P27, 7 inch, retails for only $2.50.

CRESCENT TOOLS
Give Wings to Work
Sign of the Artisan
Symbol of Excellence ®



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK



Want stability in station insulation?

Maximum strength in each joint and sure-footing give O-B Unipost high stability

O-B designed the new Unipost especially for high voltages of our modern stations. Where you need good support, such as for high voltage switchgear, you need all the rigidity, stiffness, and sure-footing you can get. A little excess deflection in an insulator stack may prevent a switch blade from making optimum entry into the clip end of the switch . . . and when switches are seldom operated, you must be doubly sure that your posts are stable. O-B's Unipost will give you that high stability.

The broad base is retained throughout the stack - - between units, at the top and at the bottom. Because of this unique construction, the O-B insulator stack has three times the base area of one using small end caps. Broad base, plus maximum strength in every joint, gives the Unipost stack high stability and rigidity.

To reduce the large bolt circle to the smaller, standard bolt circle found on many switches, simply use the Uniplates that are supplied with each stack. The Uniplate provides universal fit with any existing structure or top attachment, independent of the insulator's own mounting dimensions.

These worthwhile design improvements contribute to good, modern station design. Ask for the interchangeable Uniposts. Your switchgear manufacturer will be glad to supply them on your next switches, or you can specify them on your next stacking post order.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10101-H

OHIO BRASS MANAGEMENT REPORT

HOW HOLAN HELPS LINEMEN SHED THEIR SPURS

BY GEORGE L. DRAFFAN
CHAIRMAN, OHIO BRASS COMPANY

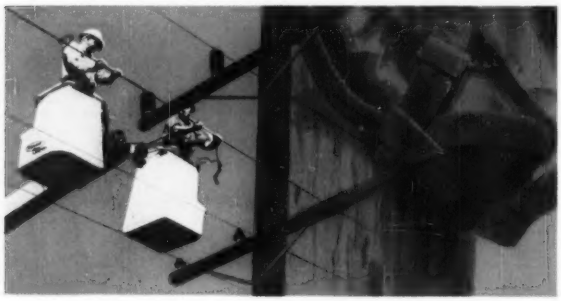
"Moving people up and down," "saving money for utilities," or "helping linemen shed their spurs" . . . these are among the many descriptions that I've heard for the over-all purpose of equipment made by Holan Corporation, O-B's wholly owned subsidiary.

A FEW YEARS AGO the only way for a lineman to get to the top of a utility pole was to climb. Now he can leave his climbers or "spurs" on the truck, step into a fiberglass bucket at ground level, pull a lever and "propel" himself as high as 85 feet in a few seconds. The minutes saved by using such aerial devices can be compounded into hours and into thousands of dollars of annual saving.

THIS IS AN INDIRECT WAY of approaching the merger almost three years ago of the J. H. Holan Corporation into The Ohio Brass Company. At that time we said the change would bring utility customers benefits in stability, flexibility and convenience. What has happened?

CERTAINLY, WE ARE PROUD of spectacular developments like a squirt boom or the insulated aerial lift that enables linemen to work barehanded on voltages as high as 138 kv. But probably of greater interest to you is the stability—financial, engineering, manufacturing, selling, servicing—that the merger has meant for the Holan operation. This kind of equipment must be backed by a stable organization.

TEN YEARS AGO the average cost of a piece of equipment sold by Holan was $4000. Today it's



$14,500. Increases in material and labor account for only a small fraction of the difference. Line bodies are about the same. The big change has come in new and more sophisticated mechanical devices—aircraft type controls, telescoping booms, high-powered diggers, complex gear mechanisms, and greater use of hydraulics. These features cost more initially. But they reduce the work-load, and cost less over the years.

THE MERGER has enabled Holan Corporation to develop the overall stability that you expect from a supplier of this equipment. It provided capital for acquiring subsidiaries that make key components, and for expanding manufacturing and service facilities. Holan equipment is now made in Cleveland, Denver, Griffin, Ga., and Niagara Falls, Ontario. It is serviced from six locations, and more will be added.

SO WE DON'T BELIEVE it's enough to offer aerial devices that promise spectacular savings in work-load today. We want to make sure you still realize these savings ten years from today. Holan offers the service that makes it possible.

AT THE MOMENT it seems like pure fantasy, but the day may come when the lineman can hang up his climbers for good. And when ten years later the new man sees them hanging on the wall and asks "what are those?", the oldtimer can answer: "Well, believe it or not, there was a time when we had to climb poles."

10149 H

OHIO BRASS COMPANY, MANSFIELD, OHIO

Porcelain Insulators – Line Hardware – Capacitors – Lightning Arresters Bushings – Holan Truck-Mounted Power Devices and Bodies – Bronze Valves

Electrical World

JUNE 26, 1961

Management Newsletter

Second Half Promises Growth to New Highs

Forecasts for the second half of '61 are touting the surprising strength of the economy. According to McGraw-Hill's Economics Department, business is fine and getting better every day. And it promises to continue in this healthy state right through the rest of this year and into 1962. The current recovery should carry the total dollar volume of the nation's business as well as the physical volume of industrial production to new high marks in each of the remaining quarters. By the fourth quarter, GNP may be over $530 billion, and the FRB industrial production index could add six points to its present level and hit 114.

This forecast is a refreshing change from that of mid-1960 when economists were engaged in the sad business of redrawing their predictions to lower levels. But it doesn't reflect a sudden rally in the economy. Signs of real strength have been apparent since early in the second quarter.

Industrial production, for instance, which fell 8% from its pre-recession peak of 111 (1957=100), hit bottom in February. Since March, it has been moving up, and is already only 3% below its all-time high. Consumer disposable income has risen some $6 billion in the past four months to about $362 billion. The month of May set a new all-time high for this indicator, and June will be another record breaker. Also, from mid-March to early May, seasonally adjusted rates of production in autos and steel have risen about 30%.

With the economy already at a healthy level, according to preliminary estimates, the outlook for the third and fourth quarters is something to crow about. It's

particularly heartening for utilities, which have watched their industrial load sag in the recession, because it's these same industrial customers that are now moving into high gear. Private domestic investment, which includes expenditures for plant and equipment, and for inventories, was at $61 billion in the first quarter. It came up to an estimated $66.5 billion in the second quarter, and the outlook is that it will add on another $10 billion from the second to the fourth quarter. This would put the fourth-quarter figure at about $76 billion, second only to the first quarter of '60 when the inventory build-up was running wild.

Two factors point to this growth in domestic investment. First is the strength of new machinery orders. The latest available index shows April orders running 3% better than March. March had already posted a 6% gain over February. And new orders forecasts by the McGraw-Hill Economics Department, after seasonal adjustment, indicate an increase of about 3% per quarter from the second quarter to the fourth.

The second factor is the change in the inventory picture. In March, business was chopping inventories at an annual rate of more than $7 billion. Most of the cutting was in durable goods both at the manufacturing and retail ends. April saw the first modest upswing in manufacturing inventories in almost a year as stocks of durable goods were no longer excessive. A need for greater inventories is now developing, and by the end of the fourth quarter, manufacturers, wholesalers, and retailers will be building up hard and soft goods stocks at a rate of about $2.5 billion per year.

Residential housing may also make some contribution to the increase in domestic investment. Easier money is almost certain to result in a turn-up by the end of the year. And housing has already recorded a fair recovery. In December, the rate of new starts was slightly under one million a year. Currently, it is about 1.25 million. There has been a significant increase in FHA commitments and VA appraisals—two sensitive guages of the future course of new home building. This indicates that by the end of the year, new starts may reach 1.35 million a year.

But, no big boom in housing is in the offing. This is because the current age distribution of our population leans toward a low level of family formations, and because vacancy rates indicate that more housing is available now than in any recent period (EW, Feb. 20, p 49).

Increasing strength in manufacturing depends, of course, upon consumer willingness to buy. Happily, consumers too seem ready to play a part in the strong third and fourth quarters. Latest surveys of consumer attitudes and intentions indicate that they are no longer worried by the recent recession or current high unemployment. More consumers now expect their incomes will remain the same or rise during the rest of the year than in earlier surveys. While there is still no hint of a buying spree, some upward shift in intentions to buy seems likely.

Automobiles, in fact, are already feeling the beginnings of new consumer enthusiasm. Auto sales, which went at an annual rate of only 5.2 million units in the first quarter, rose to 5.7 million in the second. Sales are now expected to go well over a 6-million rate in the final period of the year. Darkest spot in the auto outlook is the threat of a strike around Labor Day, but as of yet, this is only a remote possibility.

Manufacturers of other durables are also finding definite signs of improvement, although they will have to be satisfied with a modest advance. The market for appliances is fairly well saturated—about 50 million radios, refrigerators, television sets and washers; over 30 million automatic coffee makers, steam irons, mixers, phonographs and shavers. And the new 1961 and '62 models of these hard goods are not really different enough from the old ones to stimulate a buying wave.

Another reason why durable gains will be modest is the consumer credit situation. As recently as February, consumer debt was still above, by quite a margin, what economists have long considered a danger point—13% of disposable income. Families are usually reluctant to take on additional debt once this ratio is reached, and recent credit figures confirm this reluctance. New credit extensions are now running about 6% below a year ago while repayments are 5% ahead of 1960.

But at the same time, there is reason to expect some increase in appliance sales. The rise in new housing completions during the months ahead will mean increased consumer expenditures for items needed to furnish new houses. Thus we can expect a rising rate of appliance and home-furnishings purchases comparable to the rate of gain in housing—roughly on the order of 8% between the second and fourth quarter of this year.

Production and sale of soft goods will continue rising at a steady rate. Nondurable expenditures—apparel, food, drugs—go up each year along with population increases. This sector of the economy, together with the service industries, has provided some stability to the economy during the post-war industrial recessions, and will continue its climb throughout the current recovery. The result of this increment when added to gains in durables, is that consumer expenditures for all goods and services will rise by about $10 billion before the end of the year.

Government spending too will add muscle to the economy. Total government spending—local, state, and federal—increased substantially in the first quarter. In several instances, expenditures which were scheduled for later in the year were actually made in March. Thus the biggest increase in government spending for the calendar year is probably behind us. Even the new defense and space expenditures now being discussed will not be made during 1961.

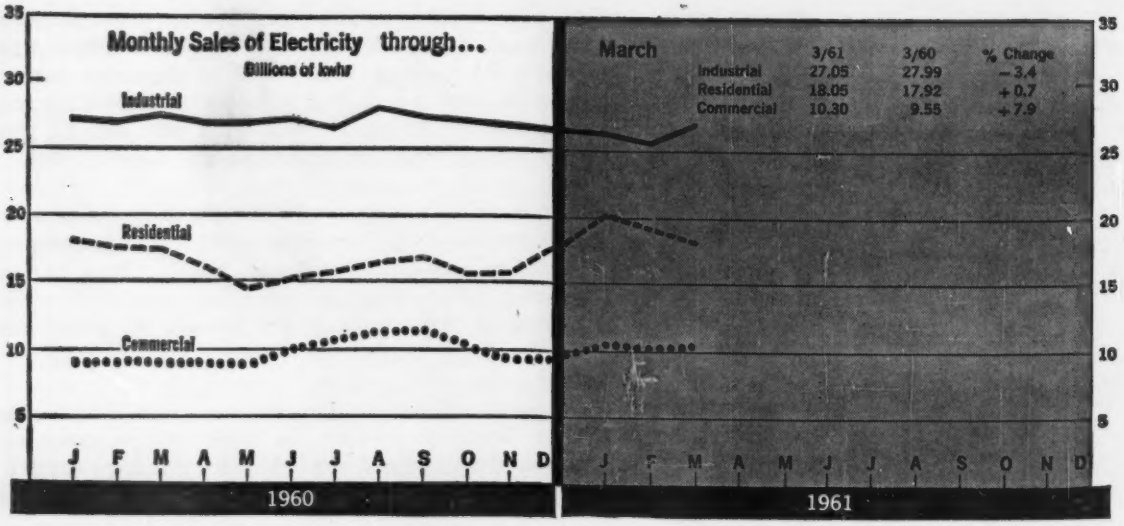
Nevertheless, government spending is expected to move upward from more than $106 billion now to about $109.5 billion in the last quarter. During the months ahead, state and local government expenditures are expected to rise faster than federal spending. This increase in state and local spending will be largely due to stepped up federally financed programs for roadbuilding, housing, educational facilities, and for increased unemployment benefits.

But while the over-all view of the economy is highly encouraging, there are a few sources of concern. One is the foreign trade situation. During the recession, American exports increased while imports remained about the same. This expanded the market for American products slightly. But as US business improves, imports will very likely rise. And most of this year's increase in exports has already taken place. From a surplus of exports over imports of about $4.5 billion in the second quarter, our foreign trade balance will probably shrink to about $2.5 billion in the fourth quarter.

Major concern for the rest of the year will be unemployment. Despite the stepup in production and new orders, unemployment levels remain at close to record heights. At the end of the first quarter, some five million Americans were out of work, representing 6.9% of the civilian work forces. Latest indications are that despite the recovery, this number has not been shaved appreciably. In May, seasonally adjusted figures showed about 4.8 million still without jobs.

There is some encouragement in reports that the hours-worked figures have been rising indicating that unemployment may be cut in the near future. But as of yet, no remarkable improvement has occurred.

Over-all, the outlook for the second half is far better than most January forecasts thought it would be. We seem to be well on the way to new highs for most indicators. But whether we can lick our unemployment problem, and whether we can sustain our new growth, are questions which are still unanswered.



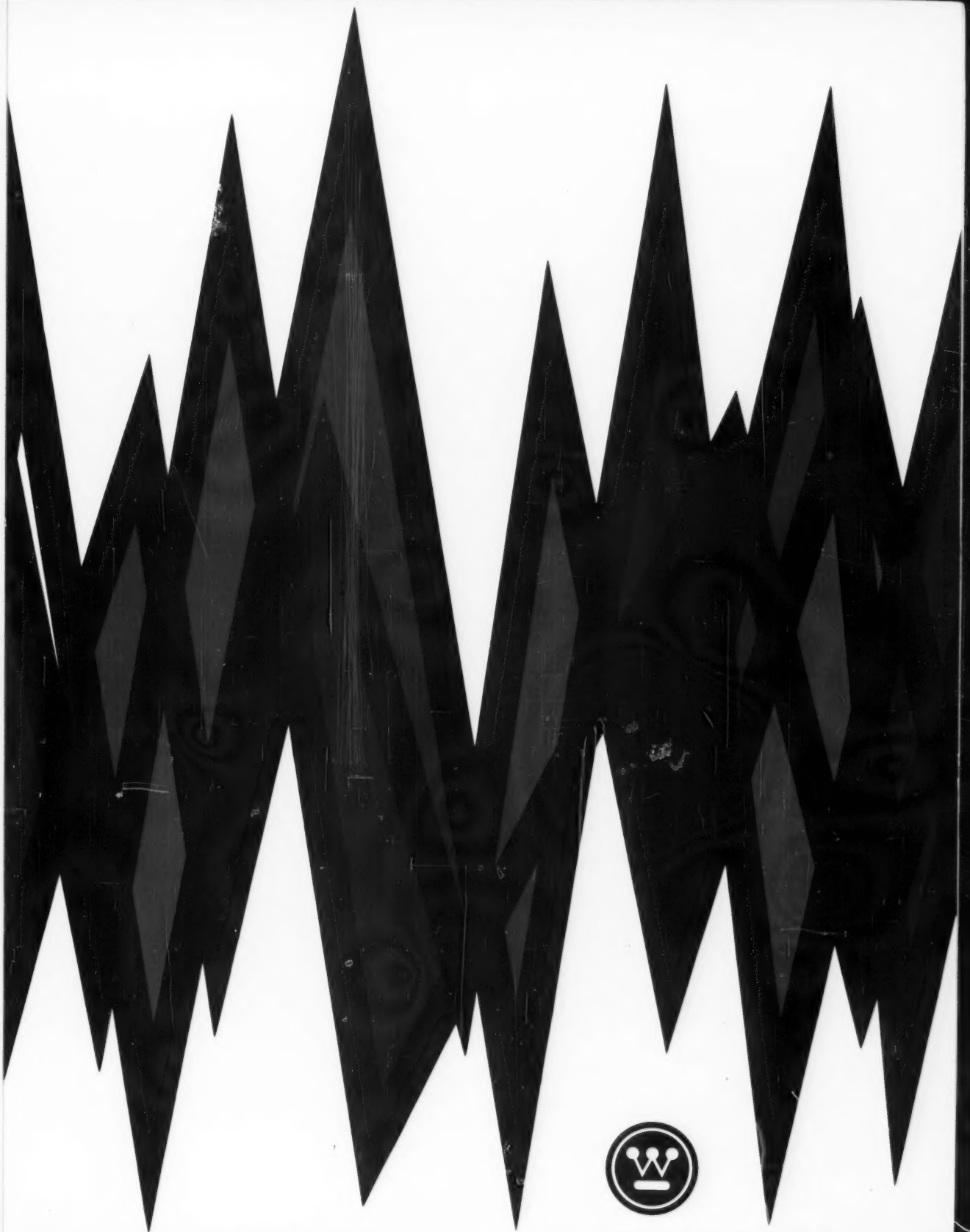
Power Statistics

		Latest Month	Year Ago	Annual Change %
Capacity	Mar.	170.28	158.73	7.3
Est. Dec. '60 Peak. million kw	Nov.	133.7	134.0	−0.2
Est. Dec. '61 Peak.	Mar.	140.5	143.8	−2.3
Production—billion kwhr	Mar.	64.64	64.30	0.5
Hydro		13.88	13.29	4.4
Fuel		50.76	51.01	−0.5
Sales—billion kwhr	Mar.	58.21	58.03	0.3
Residential		18.05	17.92	0.7
Commercial		10.30	9.55	7.9
Industrial		27.05	27.99	−3.4
Other		2.81	2.57	9.3
Fuel Consumption	Mar.			
Coal—million tons		15.00	16.33	−8.1
Oil—million barrels		7.44	8.36	−11.0
Gas—billion cu ft		128.72	107.49	19.8
Net Income Class A & B Co's—$ million	Mar.	158.60	163.21	−2.8
Residential Customers—millions	12 Mos.	51.24	50.47	1.5
Revenue per kwhr	ended	2.46¢	2.50¢	−1.6
Avg kwhr per customer	Feb. 28	3,891	3,654	6.5
Avg. annual bill		$95.72	$91.35	4.8

Business Statistics

Indexes:				
FRB Industrial Production (1957 = 100)	May	108	109	−0.9
ENR Construction Cost (1949 = 100)	June	178.3	173.2	2.9
BLS Cost-of-living (1947–49 = 100)	Apr.	127.5	126.2	1.0
New Orders for Machinery (1950 = 100)	Apr.	179	177	1.1
NEMA Sales:				
Insulation materials	Apr.	125	140	−10.7
Electric appliances	Mar.	96.3	104.0	−7.4
GNP — annual rate — $ billion	4th qtr.	503.5	486.4	3.5

Significant Changes: Industrial sales up from last month's figure of 25.81 billion kwhr. FRB industrial production index adds two more points to April's level of 106.



Effective power plant automation requires: a computer designed specifically for steam power plant process control; complete understanding of power plant equipment and processes for proper computer application • **Westinghouse provides this combination.**

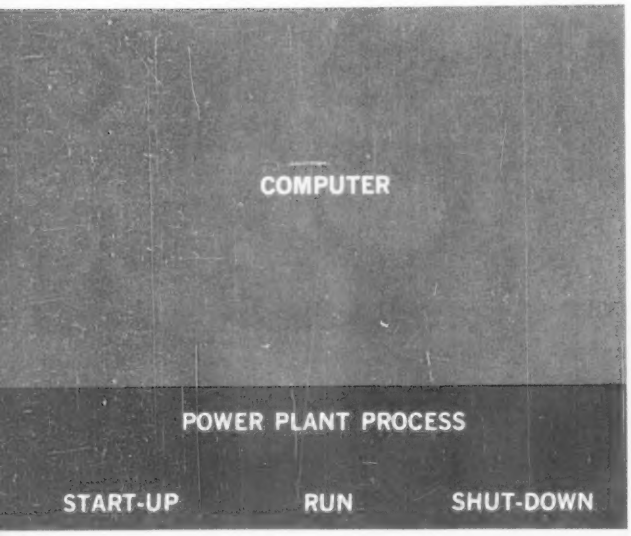
Westinghouse understanding of power plant operations is basis for PRODAC-IV design and application

There are two equally important parts to automating a plant. One is a good understanding of the process to be controlled. The second is the effective application of a large, reliable, solid-state digital computer specifically designed to supervise sequencing and control operations of the power plant process.

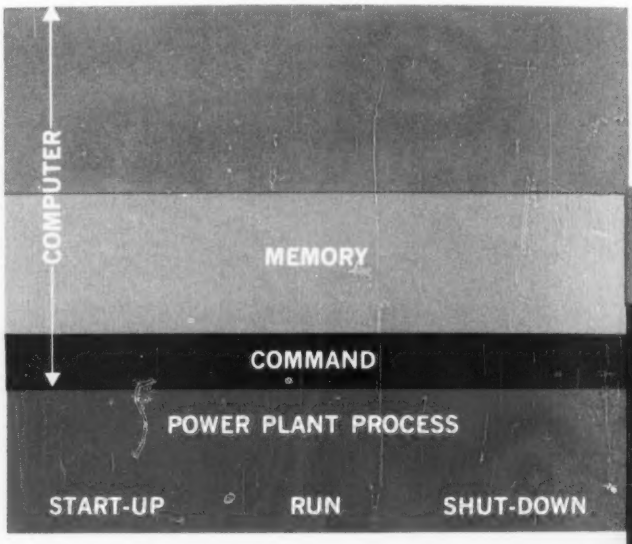
Westinghouse alone, with the PRODAC*-IV Computer system, is able to fulfill both parts of the problem. The series of illustrations numbered 1 through 4 shows how the Westinghouse PRODAC-IV system is matched to the total steam power plant process.

The remaining illustrations show how signals are

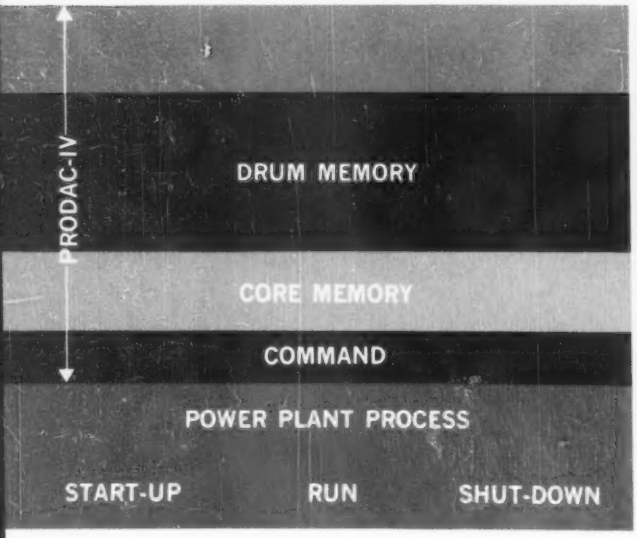
*Trademark



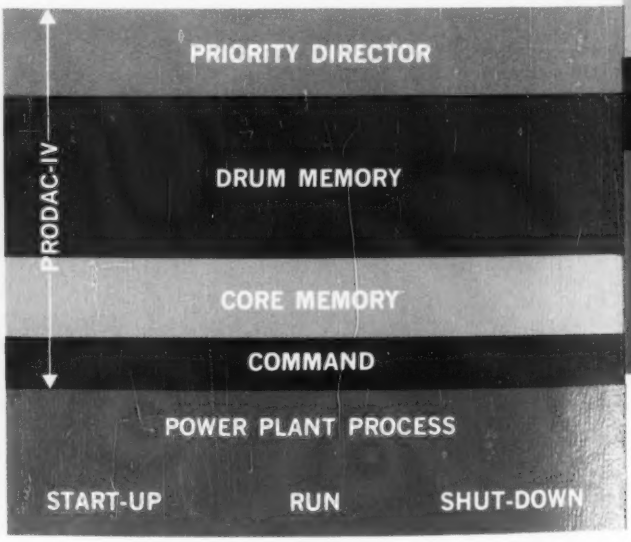
1 ANY COMPUTER, to provide full control of a steam power plant, must be matched to the total process from startup to shutdown. Full knowledge of plant dynamics is essential to make sure computer is able to handle all functions.



2 BOTH MEMORY AND COMMAND functions must be provided in the computer. The memory contains the thousands of instructions needed to control the process. The command system executes these instructions.



3 PRODAC-IV incorporates a drum and core combination memory. The drum provides economical bulk storage while the core permits rapid access. This system is more than equal to the task of controlling equipment directly during critical start-up and shutdown periods.



4 FULL CONTROL of an automatic steam plant requires simultaneous consideration of many sequences. To meet this demand, PRODAC-IV contains a priority director. This system, spread throughout the computer, selects programs to do the most important things first under all conditions.

received fro
PRODAC-IV
startup to sh
equipment. D
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normal, howe
program of a
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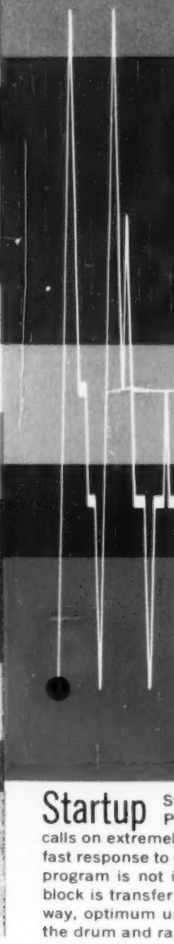
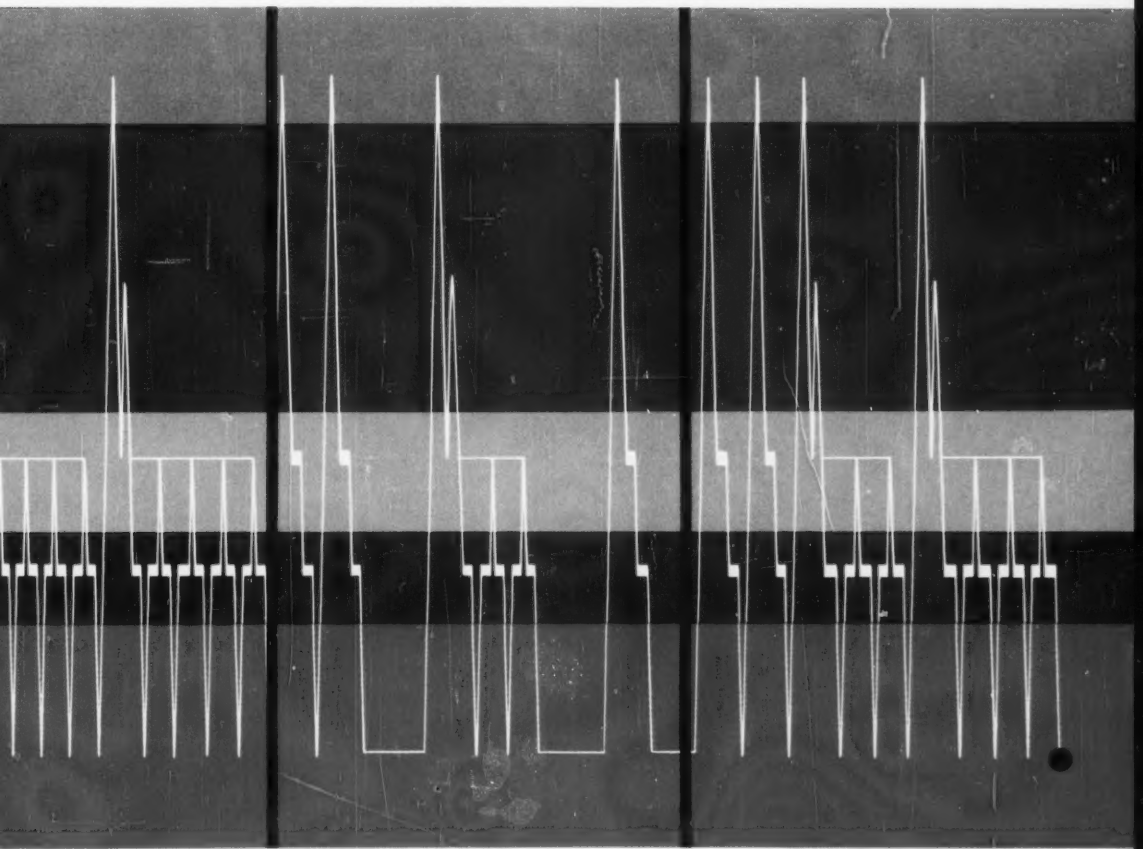


Startup
calls on extreme
fast response to
program is not
block is transfer
way, optimum u
the drum and ra

om plant equipment and acted on by
V. At all times during the process, from
nutdown, sensors monitor all participating
During normal operation, if signals are satis-
DAC-IV supervises plant process with con-
ned by sub loop systems. If the signal is off
ever, the priority director selects the proper
action from the combination memory—
s program immediately by returning signals
ss equipment. The PRODAC-IV priority
provides for storing the register contents
nded program and bringing in the contents
r priority program. This feature saves both
ce and programming time otherwise re-
nsfer back to the suspended program.
ion memory and priority director—these are
he design features which make PRODAC-
match for the entire problem of power
ation.



Startup operations are critical. PRODAC-IV's priority director ely high speed core memory for changing conditions. If needed in the core, the required data rred from drum to core. In this se is made of bulk capacity of apid access of the core.

Run During normal operations, PRODAC-IV continuously monitors and checks plant performance. If no adjustments are needed, control is left at sub loop levels under supervision of computer. Periodically, set point adjustments are made to assure optimum operation. Should an emergency occur, priority director transfers to a corrective program.

Shutdown Upon initiation of shutdown, the proper programs are automatically transferred from drum to core. This combination memory system working in conjunction with the priority director makes PRODAC-IV more than equal to the problem of direct control of all participating equipment during this critical period.

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Westinghouse understanding provides added benefits in design of computer-controlled equipment

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For fast action contact your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

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File No. EU
CP-1062

Litho in U.S.A.

Selling

Central residential air conditioning will go into a development in Maryland. Maryland City, currently under construction in Anne Arundel County, will be a self-contained community of 5,000 homes, recreation and community centers, business district and light industry. All homes will have central air conditioning as standard equipment . . . **Giant solar glass bubbles** are being installed at Houston, Texas' Sharpstown Center to seal off the Center's unique 900-ft-long mall for year round air conditioning and maximum natural lighting effects . . . **Hollywood Boulevard** now has 150 lighting fixtures giving off over 10 foot-candles. The new lights highlight 15,000 feet of terrazzo sidewalk containing the names and symbols of 1,200 radio, television, recording and motion picture stars. Luminaires designed specially for the installation each contain three 700-w deluxe white mercury vapor lamps . . . **Sales** of 776 electric home heating jobs, 289 of which were initiated by employees, were recorded in Appalachian Power Co's "Employees' Home Heating Prospect Campaign" and "Trade-In Program." Latter campaign was aimed at the conversion market, and 365 sales during the three-month drive were conversions from other heating systems . . . **Duke Power Co** is even getting its Gold Medallion story across to impressive youngsters. Police investigating missing building materials from a construction job came across a tree hut made of the lost materials. Tacked to the shelter was a sign, "Falconhurst, a Gold Medallion Hut". . . **Theme** of the National Electrical Manufacturers Assn Second National Electric Comfort Heating Exposition and Symposium will be "Sell Electric Comfort Heating Cooperatively." Details available from R. D. Smith, NEMA, 155 E 44th St, N. Y. 17, N. Y.

Correction

On page 81 in the June 12 issue a picture caption stated that the building pictured was the Atlanta Merchandise Mart. It should have said the building was the Georgia Power Co's new 22-story office building.

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News About People

Bower Elected Head of Narragansett Electric

BOWER ▶

Edward C. Bower has been named to succeed Edward G. Twohey as president of Narragansett Electric Co. Twohey will be assigned other duties within the New England Electric System.

Bower, president of Merrimack Essex Electric Co of Massachusetts, has been with the New England system 35 years. He began as a student engineer and rose to various supervisory and executive positions in several system subsidiaries.

Stoddart Becomes Northern States Power Vice President

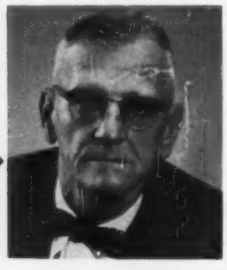
Northern States Power Co has picked J. E. Stoddart to become vice president in charge of marketing.

The former general sales manager will have charge of commercial, industrial and residential sales of electricity and gas as well as merchandise sales activities and the company's home service department.

Stoddart has been with Northern States Power for 27 years. He began in the merchandise sales department and moved up through the ranks.

◀ STODDART

Powell Named Vice President of Mississippi Power & Light



POWELL ▶

J. J. Powell has stepped into a vice presidency at Mississippi Power & Light Co.

The general sales manager was one of the founders of Mississippi P&L's sales department in 1926, three years after the company was organized.

Before coming to Mississippi P&L Powell was general superintendent of Adirondack Power & Light Co. At Mississippi P&L he has been a division sales manager, sales promotion and advertising manager, and residential sales manager.

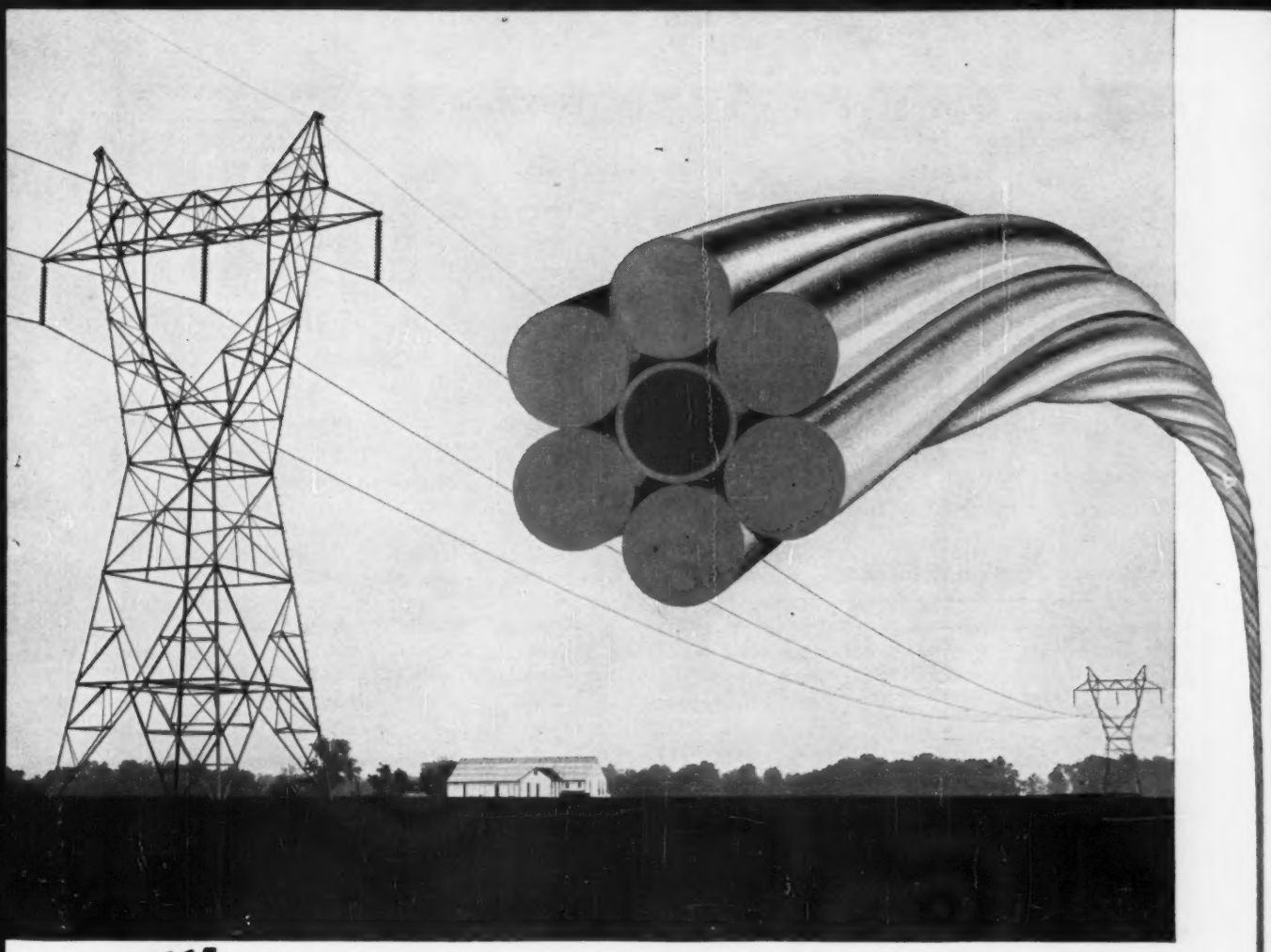
Dauber Moves to Chas. T. Main as Thermal Power Unit Head

Clarence A. Dauber, presently director of civil and mechanical engineering for Cleveland Electric Illuminating Co, has been appointed to head thermal power engineering activities of Chas. T. Main, Inc.

He will join the Boston consulting firm July 1. Dauber has been active in coal pipe-line development as well as in design and construction of over two million kw of power plant capacity.

(*More News About People on page* 138)

◀ DAUBER



NEW Bethalume ACSR Core Wire

STEEL COATED WITH ALUMINUM COMBINES STRENGTH WITH HIGH CORROSION RESISTANCE

Bethlehem now offers Bethalume (aluminum-coated) ACSR core wire along with our two other types of core wires: our exclusive bethanized (electrolytic zinc-coated), and our hot-dip galvanized wire. This triple selection gives utility companies a choice to meet virtually every atmospheric condition.

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DEPENDABLE PERFORMANCE is assured because Bethalume ACSR core wire meets all requirements of ASTM Specification B-341.

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For full information, get in touch with the nearest Bethlehem sales office, or write to us at Bethlehem, Pa.

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PERSONAL . BRIEFS

Raymond D. Welch has been promoted to assistant general engineer of Tampa Electric Co.

Western Power & Gas Co has made **J. B. French** a director and executive committee member.

Martin E. Juhl has become chairman and president of Wisconsin Utilities Assn. He is president and general manager of Lake Superior District Power Co.

British Columbia Electric Co has appointed **J. D. King** industrial development manager of the marketing division. He succeeded **William A. Dow** who resigned.

Middle South Utilities Co has elected **John Adams** assistant secretary and assistant treasurer.

L. N. Talbott has resigned as employee relations director for Central Illinois Light Co and accepted an executive post with Illinois Power Co. He will be engaged in industrial relations activities. **Charles E. VanDyke** succeeded him at CILCo.

Public Service Co of Oklahoma has promoted **L. F. Rylander** to general substation superintendent.

Erwin C. Withers has been named secretary-treasurer of Monongahela Power Co. He succeeded **G. J. Jackson** who retired as secretary.

Arizona Public Service Co has appointed **H. W. Hugh Cocklin** as superintendent of the new Four Corners power plant.

R. J. Pech, Green Bay system operating supervisor for Wisconsin Public Service Corp, has retired. **M. A. Peot** succeeded him.

J. Lane Morthland has resigned as assistant administrator of Bonneville Power Administration.

Philadelphia Electric Co has boosted **J. L. Peters** to superintendent of the stores division.

Lamar Kelly has joined the management consulting division of Ebasco Services Inc as director of personnel management services.

Kaiser Steel Corp has elected **C. F. Borden** a director. He is executive vice president of Kaiser Steel.

A former executive vice president and, since 1957, special consultant to the chairman, **Latham E. Osborne** has retired from Westinghouse Electric Corp.

At General Electric Co, **Walter A. Mosteller,** who has been with the company 38 years, most recently as user sales department manager, has retired. In GE's silicone products department, **William C. Giegold** has become quality control manager; **Frank V. Summers,** intermediate process engineering manager; and **John R. Goggin,** maintenance and utilities manager.

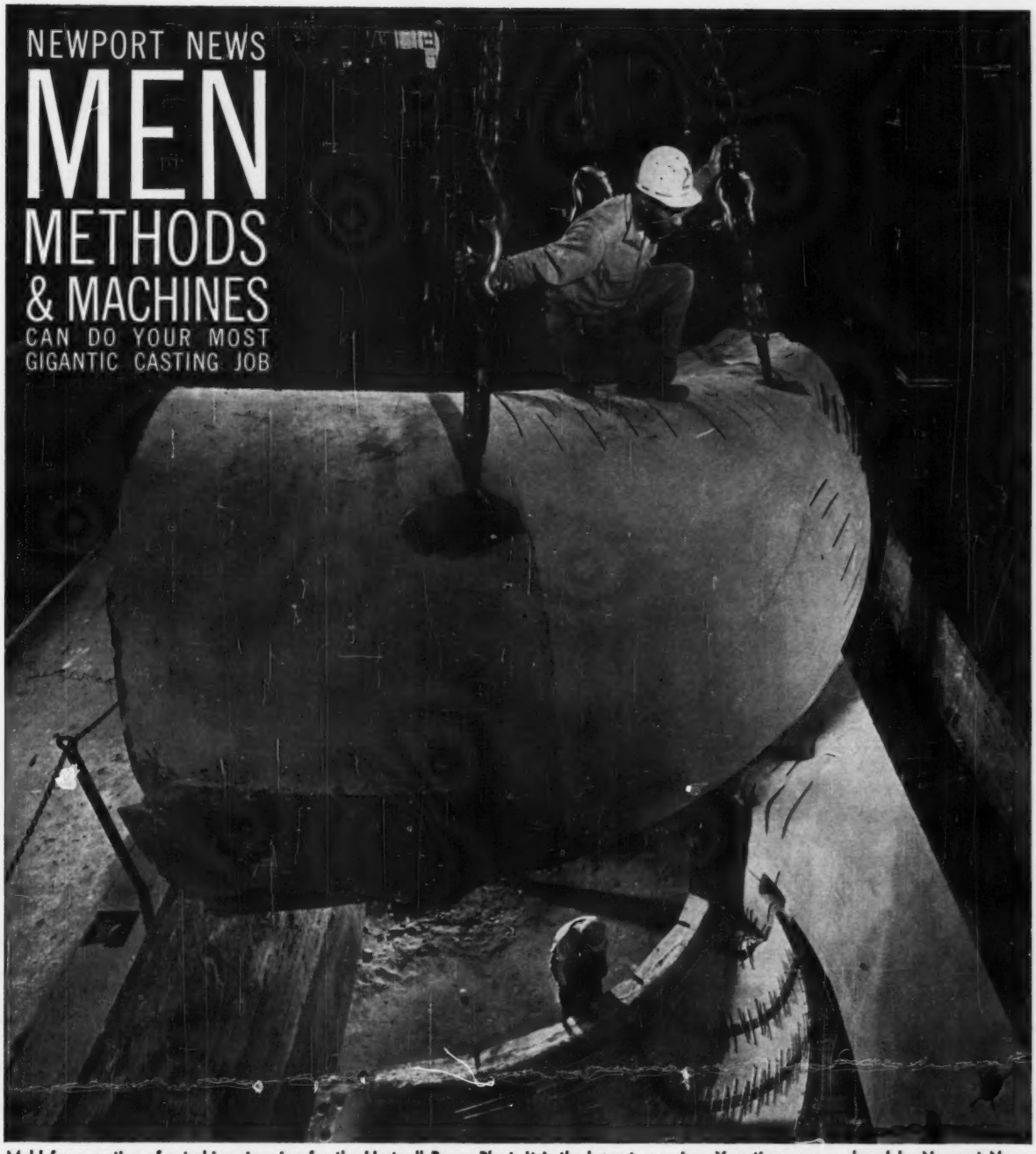
Gene E. Lewis was appointed marketing manager following GE's combination of the engineering and marketing function in the high voltage specialty transformer section. **Robert A. Branflick** became engineer-product and market planning in the combination. GE has made five appointments to the superpower microwave tube laboratory at its power tube department: **Dr Garland M. Branch** became consulting microwave physicist and **Roger J. Segalla** became radio frequency measurements specialist, both in the research section; and **Charles W. Bleichner** was named circuitry engineer and **Jerome J. Hamilton** and **W. John Pohl,** design engineers, all three in the advanced engineering section.

GE has picked **Patrick A. Travisano** as manager of the newly formed heavy mill engineering subsection of the industry control department.

Retired GE Officer Dies

. . . LANG

Chester H. Lang, 68, retired vice president in charge of public relations for General Electric Co, has died. He was with the company more than 36 years.



Mold for a section of a turbine stay ring for the Hartwell Power Plant. It is the largest one-piece Y-casting ever produced by Newport News.

It takes all three—men, methods and machines to tackle a job as big as this one! Newport News has completed many of them including six hydraulic turbines for the Niagara Project, four for the Hartwell Power Plant, and many others.

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The secret of its leadership in the fabrication of heavy equipment is its staff of highly trained engineers and technicians, thousands of skilled workmen and 225 acre plant capable of turning out such projects as hydraulic turbines and valves, vacuum or pressure vessels for the petrochemical industry, bridge caissons, wind tunnels, and pulp and paper equipment.

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NEWPORT NEWS, VIRGINIA

Colorado River Transmission Argued

Controversy continues to swirl about the proposed Colorado River Storage Project as a parade of witnesses passes before the closed sessions of the House Appropriations Committee's Subcommittee on Public Works. The subcommittee has been proceeding cautiously in sifting the conflicting testimony.

The subcommittee is considering whether Congress should appropriate $4.9 million to begin construction of an all-federal transmission system. The Kennedy Administration has asked for $13.6 million for transmission line construction, but the bulk of this money is for remote areas where there is no opposition to federal construction.

Utah's Governor George D. Clyde and Senator Wallace F. Bennett, both Republicans, fought proposed government construction of the transmission lines. Clyde said that he opposed federal construction because it competed with private industry, caused "needless duplication" of spending, and deprived both state and federal governments of tax funds.

Federal income taxes from the transmission system, Clyde noted, are estimated at more than $100 million per year over the 86-year period which has been used for calculation. In the state of Utah, state and local taxes of $700,000 a year would be lost if the lines were built by the government.

Sen Bennett predicted that taxpayers would save at least $160 million if private utilities built the lines. He said that there was no opposition to the construction of the one-third of the lines in remote areas by the federal government, but he called federal construction wasteful in areas where it would duplicate private lines.

A sharp break in the Utah delegation appeared, though, as Sen Frank E. Moss and Rep David S. King, both Democrats, testified for federal construction. King claimed that private proposals would "cost the reclamation fund millions of dollars more" and would result in higher costs to consumers, while observing that both the Eisenhower and Kennedy Administrations had favored federal construction.

Moss maintained that he was not opposed to private construction if costs were the same as the federal proposals. "From the facts I have seen, however, I must go along with the Bureau of Reclamation proposals," he said.

The relative cost to consumers of the various plans has been the subject of a strong dispute. E. M. Naughton, president of Utah Power & Light Co, said private construction would bring power to preference customers at no greater cost than the federal proposal. Bureau of Reclamation and co-op witnesses contested Naughton's estimates.

News Scope

CO-OPS WIN—Oklahoma Gov J. Howard Edmondson has signed two measures aiding co-ops in competition with investor-owned utilities. One act forbids an electric supplier from offering service to a customer living within 500 ft of a competing line. The second provides that when a city annexes rural electric territory the co-op may remain in the area by paying the same franchise tax as paid by the public utility servicing the city. The Oklahoma attorney general, however, opined that the latter law is unconstitutional because it violates a constitutional provision dealing with the granting of franchises by cities.

CO-OPS LOSE — A bill which would have allowed cooperatives to continue operations and to expand in areas annexed to municipalities was killed in the North Carolina legislature June 14 after it was amended to require them to sell out to investor-owned companies in such a situation. The North Carolina State League of Municipalities, as well as the investor-owned companies, opposed the bill in its original form. The bill was allowed to die at the request of its original sponsors after it had passed second reading in the Senate. The sponsors contended that rural co-ops would "die on the vine" if they were not allowed to hold onto facilities in well-developed areas, which are rapidly being annexed by municipalities.

NEW SOVIET LINE—Russia will soon commission the western strand of the 500-kv grid connecting the hydroelectric plants of Stalingrad with Moscow, *Tass* claims. According to the Soviet news agency, the eastern strand of the grid, operating for the past 18 months, has transmitted some 5 billion kwhr to Moscow. Capacity of the line is said to be sufficient to pass the entire production of a 1,500-1,800-Mw station.

FPC FUNDS — FPC Chairman Jerome Kuykendall has asked the Senate to endorse an appropriation of $8,793,000 approved by the House. Kuykendall told a Senate Appropriations Subcommittee that the fund, for operations in the year beginning July 1, would provide the FPC with 82 new and needed employees. Most of a requested $629,500 increase would go for natural gas industry work, Kuykendall said.

NOT QUITE—The eternal light of Menlo Park, lighted 29 years ago to honor Edison, fell short of its goal. It went out last week. The light is actually a reflector which catches illumination from a group of lights hidden in the pedestal. A short knocked out all the concealed lights at one time. A committee is now considering renovating the memorial.

APPOINTMENT URGED — Sen William Proxmire (D-Wis.) has urged President Kennedy to appoint W. R. Connole to the FPC. Connole served on the FPC for five years during the Eisenhower Administration. Eisenhower refused to reappoint him in 1960. Proxmire called Connole "the one member who tried to regulate the oil and gas industry effectively and in the public interest."

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Static Devices Simplify Controls

PEA Relay Committee told protection needs of diodes, transistors solved by circuit design and surge-shunting diodes

Growing understanding of surges in control circuits, and development of circuitry and devices to limit them, are enabling utilities to apply semiconductor devices in station control schemes. Thus they are cutting down on moving parts and gaining simplicity in control schemes. These conclusions were evident in a group of papers at the recent Pennsylvania Electric Assn Relay Committee meeting at Skytop, Pa.

Semiconductor diodes, according to J. L. Koepfinger and C. M. Jackson, Duquesne Light, can now be considered reliable for relaying applications. In many cases they will supplant auxiliary relays, as long as care is exercised to protect them against excessive current or inverse voltage.

In a typical application to 69-kv terminal control, diodes separate the trip circuit from the backup timer and enable use of a distance relay with self-contained fault detectors, they said. Thus diodes permit more complete relay protection without extensive use of auxiliary relays. Diodes were applied on the basis of their short-time ratings, but with inverse voltage capabilities to withstand control circuit surges determined by tests to run up to 450 v in a 130-v system, they said.

Circuit designers and equipment operators have a joint responsibility, said H. T. Seeley, General Electric, to find circuits in which semiconductor devices offer advantage in faster operation, smaller size, or lower cost. He recommended learning the devices' limitations, evaluating prospective applications, and designing circuits to make these factors compatible.

Surges from the interruption of coil circuits are the most frequent causes of rectifier failures in dc control circuits, Seeley continued. These can be limited by capacitors, resistors, or discharge rectifiers, much as the back-to-back Zener type which holds crest voltage to 80 v for a 10-amp surge.

Applied as a surge protector for audio-tone equipment, according to Koepfinger and Jackson, the Zener device limits input to tone equipment to 27 v with 100 v applied to the incoming telephone pair.

Surges from inductive "kicks" in dc control systems may have steep fronts or high-frequency oscillations, observed W. K. Sonnermann, Westinghouse. In some circuits, these will be dissipated harmlessly, while in others they cause diode failures. Remedy may be found in circuit redesign, in using semiconductor devices of higher inverse-voltage capability, or in reducing the surge. He emphasized that measurements require careful instrumentation to record the full magnitudes of the incoming surges.

Cuba to Get Russian Unit

Part of goods to be exchanged between Russia and Cuba is a 50-Mw steam turbine, according to the news agency *Tass*. The unit is said to be designed for operation at 1,279.8 psi, 995F, and 3,600 rpm. Shipment is scheduled for late this year, the report says.

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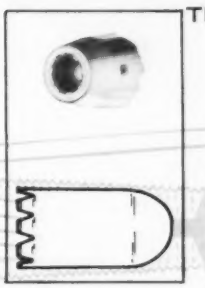
SPLICE and DEADEND

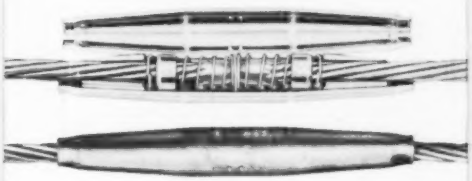
AAC, AAAC AND COPPER . . . WITH



RELIABLE "55" SERIES
PILOT CUP TYPE

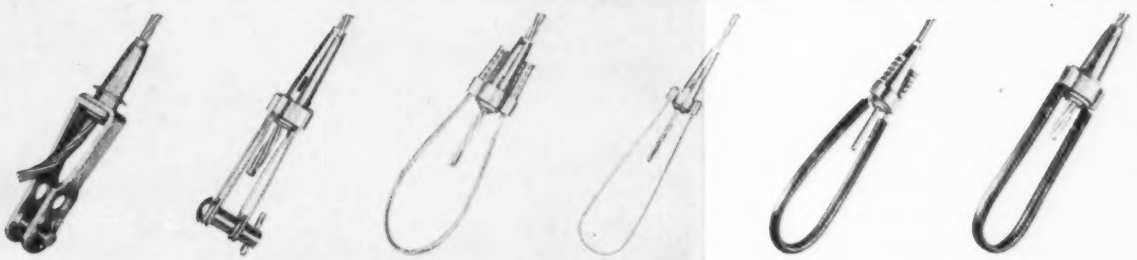
Pilot cup, factory installed in Reliable tension splices, either caps or refuses bent, out-of-lay or burred strand. The chuck cannot engage the conductor until the pilot cup, enclosing strand ends, has been run completely through the chuck. THUS ONLY SOUND CONDUCTOR IS POSITIONED WITHIN THE GRIPPING AREA.

Tensile tests prove the ability of these splices and deadends to hold 100% of the book rated strength of the conductor — AAC, AAAC or copper.



Catalog Number	AAC 7 Strand	AAAC 5005
AL5547	4	5
AL5527	2	3
AL55101	1	2
AL55107	1/0	1
AL55207	2/0	1/0
AL55307	3/0	2/0
AL55407	4/0	3/0
AL55266.8	266.8	4/0

FEED-THRU DEADENDS



"LINES UP"
Reliable's latest movie tells the whole story. Be sure to see it.

During twenty-seven years of continuing production it has never been reported that a Reliable Feed-Thru Deadend chuck let go a line

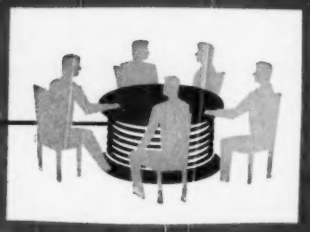
Reliable

ECTRIC COMPANY Franklin Park, Illinois

A Symbol of Integrity Since 1909

DU PONT

WIRE AND CABLE ROUND TABLE



You have asked...

Q: What is the straight story on the flammability of polyethylene?

A: Polyethylene is rated as a "slow-burning" material, like rubber and many other materials. Its performance in flame tests depends on the construction. For instance, #6 AWG copper line wire with 2/64" of ALATHON 5, BK22 polyethylene resin passes the horizontal flame test. If you need a truly "self-extinguishing" insulation which will pass the U/L vertical flame test, use Du Pont RULAN flame-retardant plastic (based on polyethylene).

Q: What is the best nylon and best polyethylene for outdoor service? How long will they last?

A: The best outdoor nylon is ZYTEL 37X nylon resin. It contains well-dispersed carbon black, and a good heat stabilizer. We do not know yet what its outdoor life will be, but it has stood up over 17,000 hours in the Weather-O-Meter (unfiltered arc) without failure.

ALATHON 1000 BK-30 is Du Pont's best polyethylene resin for outdoor service. It should be good for well over 20 years (possibly over 40).

Q: I have had trouble with thermoplastic jackets splitting and jamming conduits during pulling. Do you know a good lubricant?

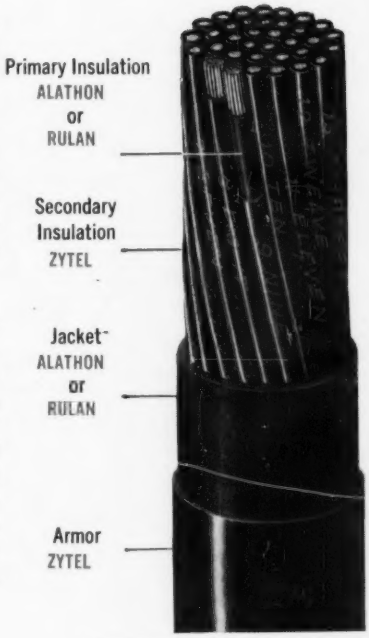
A: Maybe you're using the wrong thermoplastic. We are having great success with jackets of ZYTEL 37X. This product is extremely hard and slick, exceptionally tough, easy to pull. 37X looks good for direct burial cable, too, where you have especially tough plowing conditions.

Du Pont does not manufacture wire and cable, but supplies thermoplastic resins for insulation and jacketing.

Save 20-35% installation space with Du Pont plastics

Extensive research has shown that the properties of ALATHON polyethylene resins permit a thinner primary insulation with equal or better dielectric performance than other compounds. Result: smaller over-all cable diameter and smaller conduits are practical. Depending on the number and size of conductors, savings of 20% to 35% in thickness over the older constructions are thus possible.

For extreme cases, where the possibility of fire precludes the use of polyethylene, Du Pont recommends the use of RULAN, a flame-retardant plastic, in the same thickness as ALATHON. For secondary insulation, a thin skin of ZYTEL nylon resin imparts exceptional abrasion resistance and higher operating temperature limit. Where mechanical abuse or chemical attack pose a problem, an armor of ZYTEL gives maximum protection.



A typical control cable design that takes advantage of the superior properties of Du Pont plastics is shown at right. For complete information on the use of ALATHON, RULAN and ZYTEL for improving signal and control cable design, send for your copy of Polychemicals Department Booklet WC-3 "Signal and Control Cable Design." Write: Du Pont Company, Rm. EW515, Polychemicals Dept., Wilmington 98, Delaware. *In Canada:* Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.

POLYCHEMICALS DEPARTMENT

DU PONT

REG. U.S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

ALATHON® POLYETHYLENE RESINS | **RULAN®** FLAME-RETARDANT PLASTICS | **ZYTEL®** NYLON RESINS